United States Patent [19]
Gullo
[11] 4,044,290
[45] Aug. 23, 1977

[54] DRUM CONTROL SYSTEM

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[73] Assignee: Typographic Innovations Inc., New York, N.Y.

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[51] Int. Cl.² G05B 5/00; H02H 7/08; B41B 13/00
[52] U.S. Cl. 318/640; 354/5; 354/7; 354/11; 354/13; 354/15
[58] Field of Search .... 354/5, 7–9, 354/11–16; 318/640, 685; 178/6.7 R

[56] References Cited

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3,715,645	2/1973	Viret et al.	318/640 X
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Primary Examiner—John Gonzales
Attorney, Agent, or Firm—Hubbell, Cohen, Stiefel & Gross

[57] ABSTRACT

A drum control system for providing a predetermined incremental lateral spacing on a drum surface to be accessed in response to a request signal therefor in which the degree of rotation of the drum is controlled in response to the request signal to provide the predetermined incremental lateral spacing by selectively optically reading one of a plurality of optically readable encoded discs each of which has a plurality of circumferentially extending bands, with each of the bands being encoded to correspond to a different uniform proportionate degree of incremental rotation of the drum. The discs are optically read by associated selectively energized optical readers, such as photocells, when the band to be read is illuminated by a substantially simultaneously selectively energized light source. The plurality of discs are preferably arranged in pairs in which a common light source illuminates both discs of the pair with the appropriate associated photocell being selectively energized so that only one disc of the pair is optically read. The light sources and photocells are commonly mounted on a incrementally movable platform which may be indexed to commonly optically align the light source-photocell associated with the band to be read, each of the bands on a given disc preferably being radially spaced apart. The disc may preferably be mounted on a common shaft with the drum and held in place by a threaded resilient clamp which secures the disc in a given predetermined axial position on the shaft as well as enables the provision of the desired spacing between adjacent discs. The drum as well as the indexible light source-photocell platform, are preferably commonly mounted on another incrementally movable platform for simultaneous movement therewith with this platform being axially movable in the direction of the longitudinal axis of the drum, preferably bidirectionally, in response to a request signal for a different predetermined axial position or line feed on the drum surface relative to a fixed access location with the request signal being dynamically variable or programmable, such as from a computer. The system may be employed in a phototypesetting system, such as with a conventional Alphatype or Alphasette incremental model in which predetermined codes normally associated therewith may be swung, such as by means of an attachment to the conventional Alphatype recorder, to provide the code signals which control the operation of the programmable line feed circuitry as well as the indexing and lamp-photocell selection circuitry.

54 Claims, 19 Drawing Figures

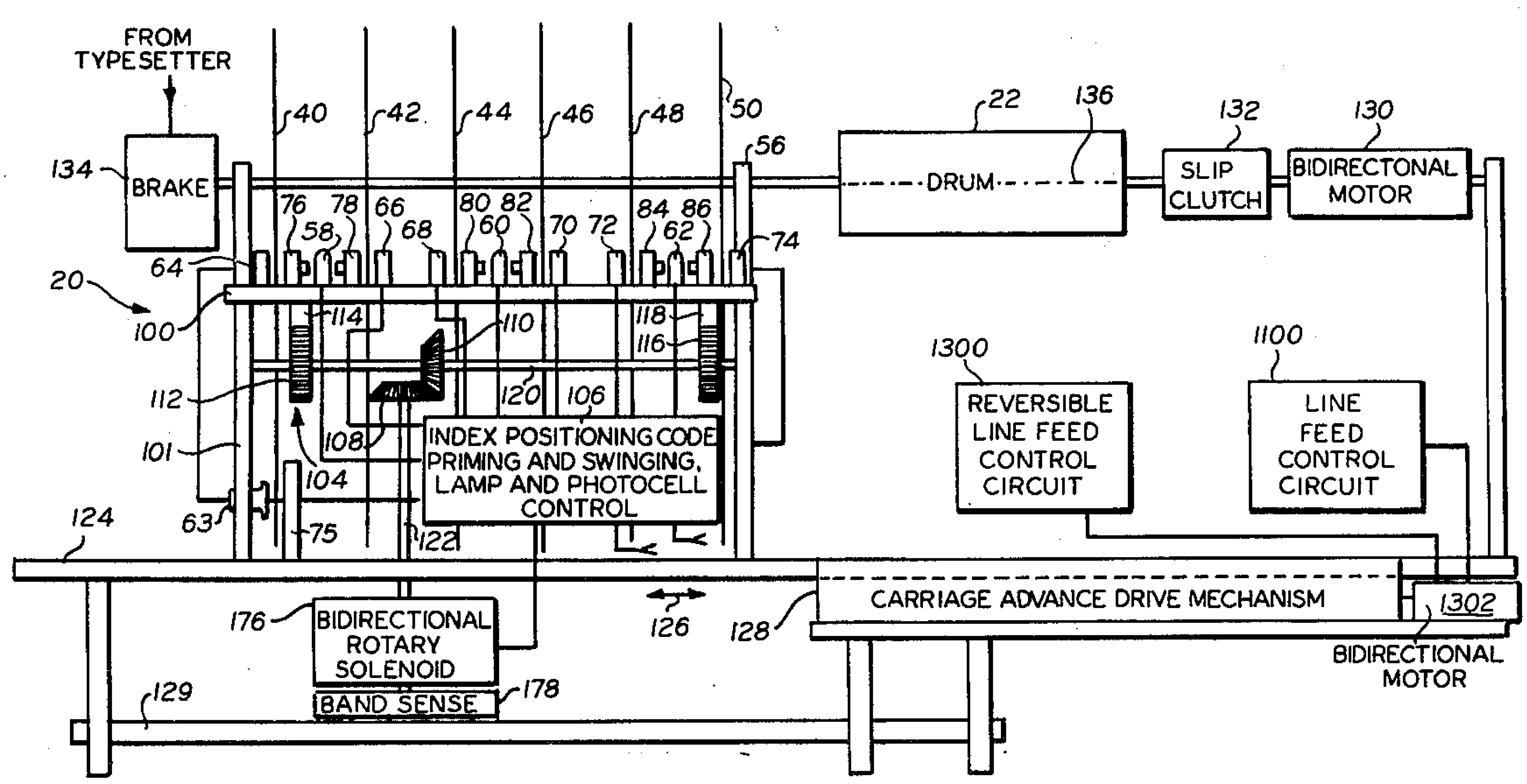


FIG. 1.

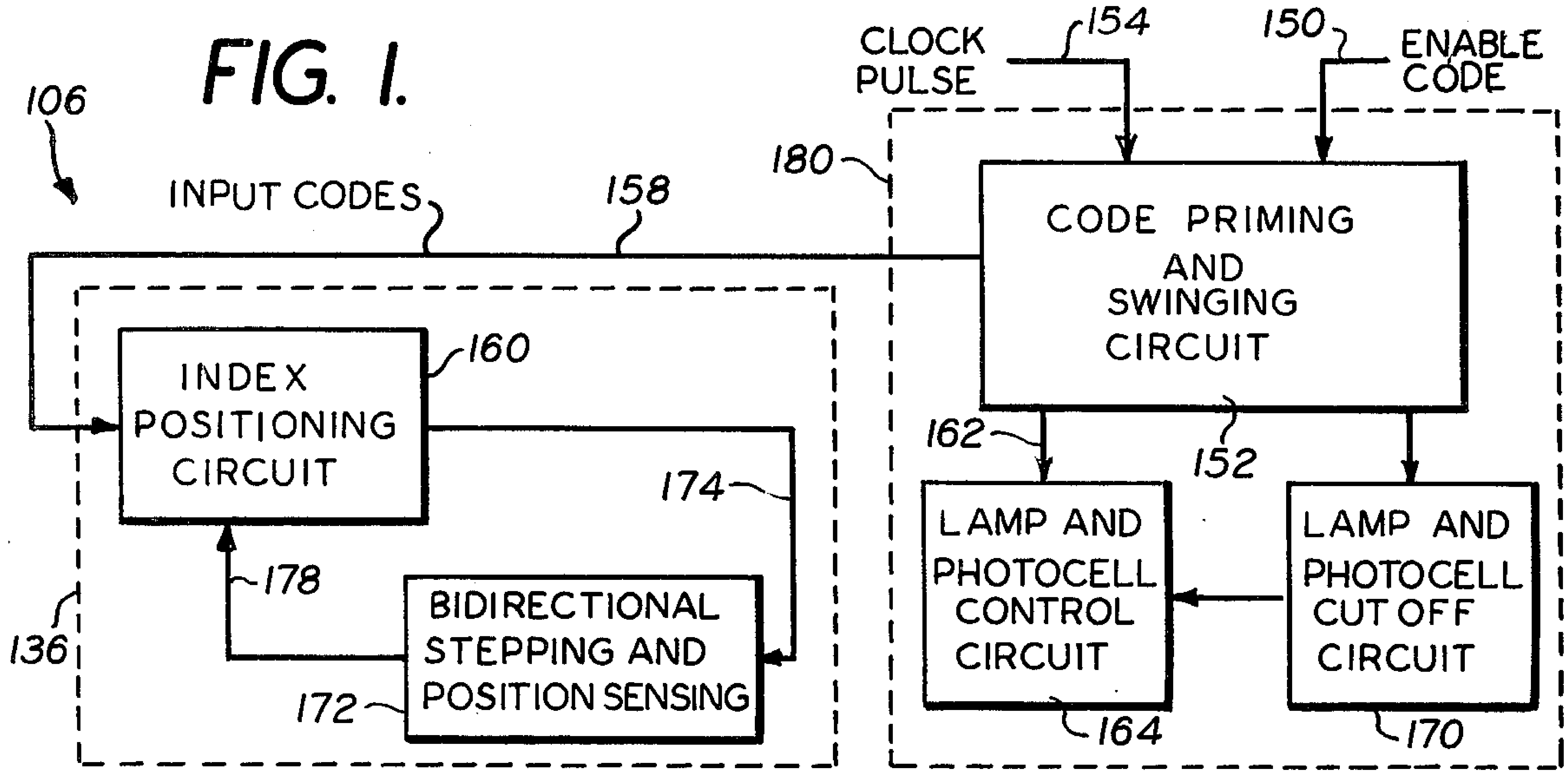


FIG. 2.

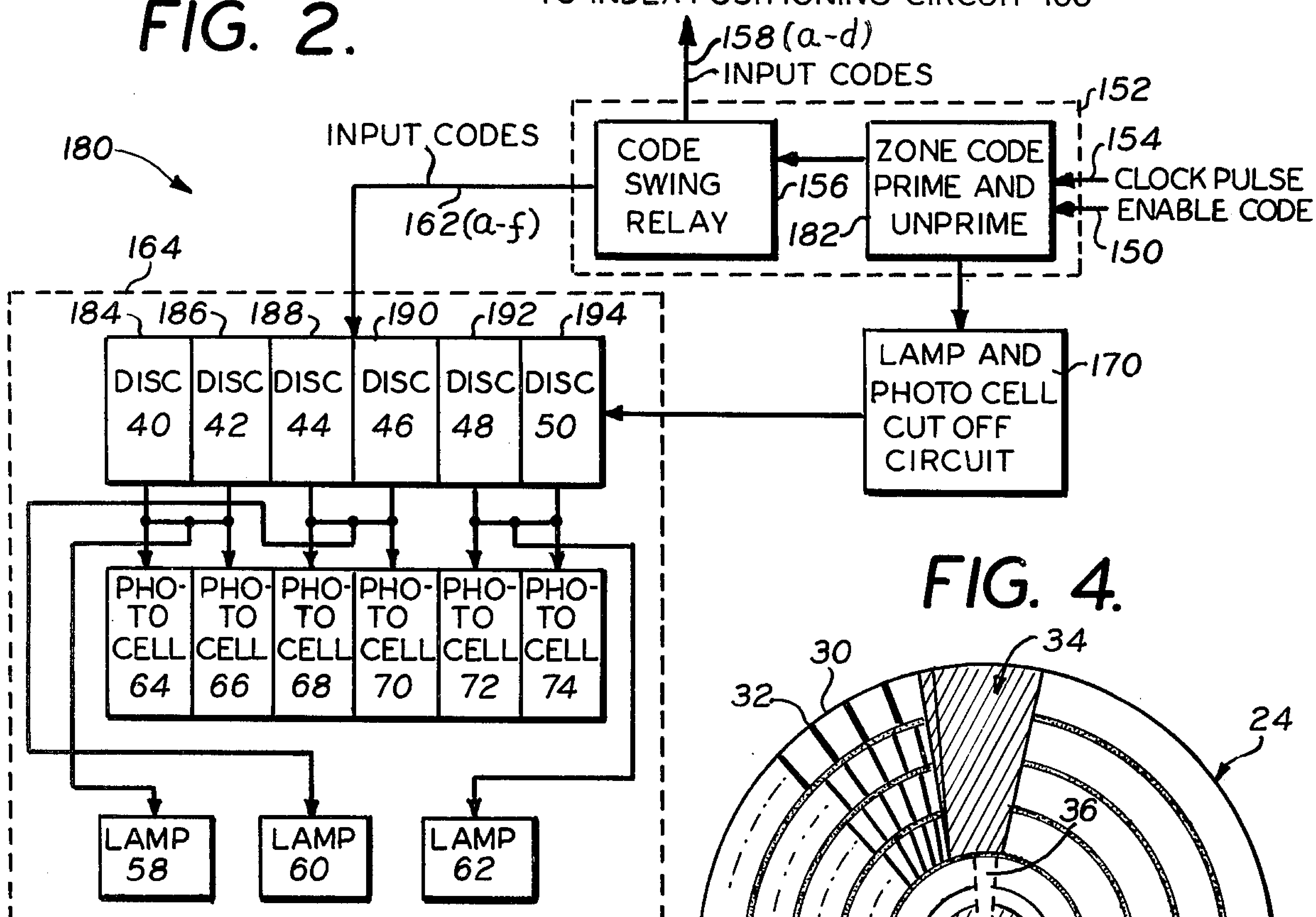
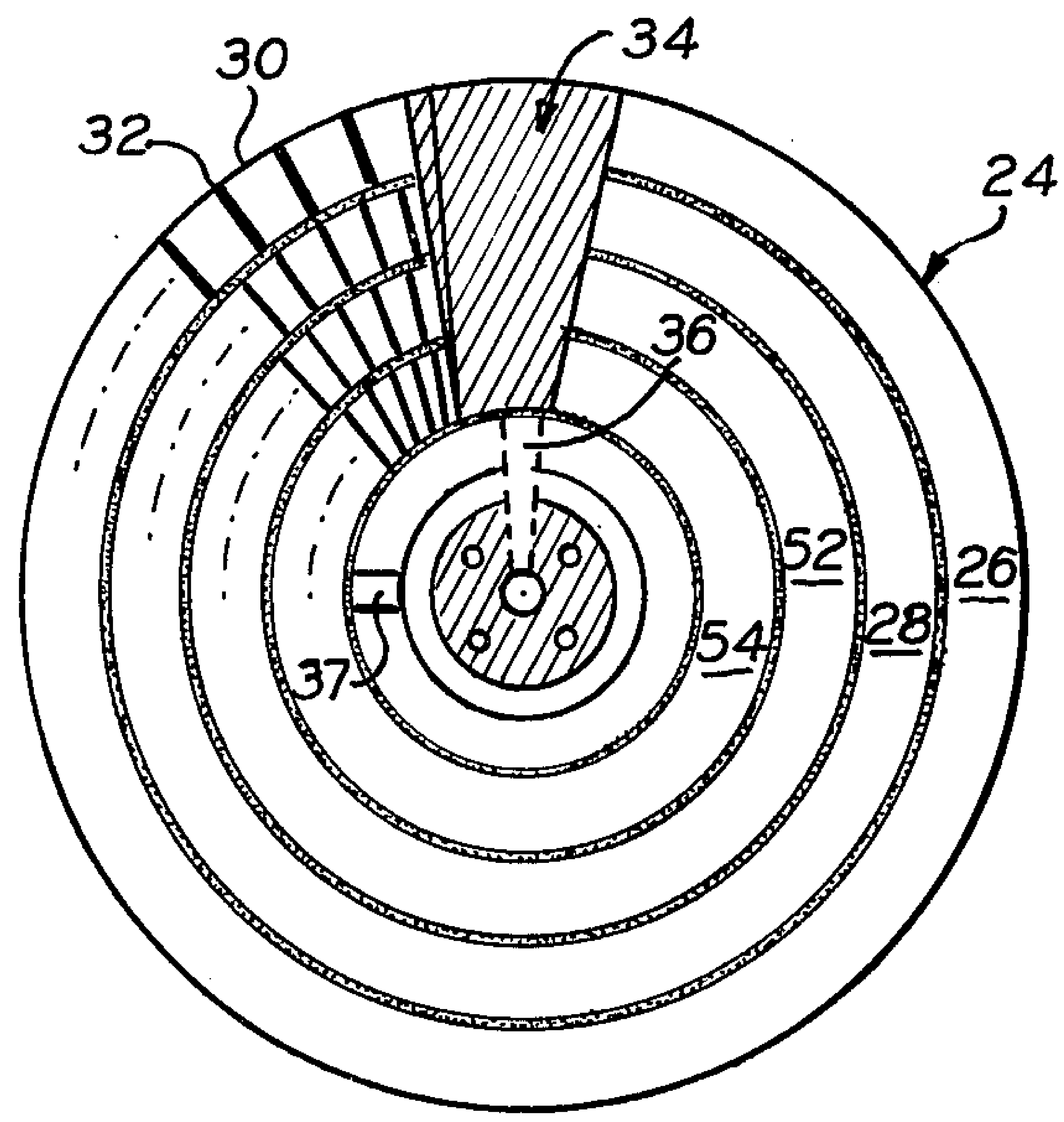


FIG. 4.



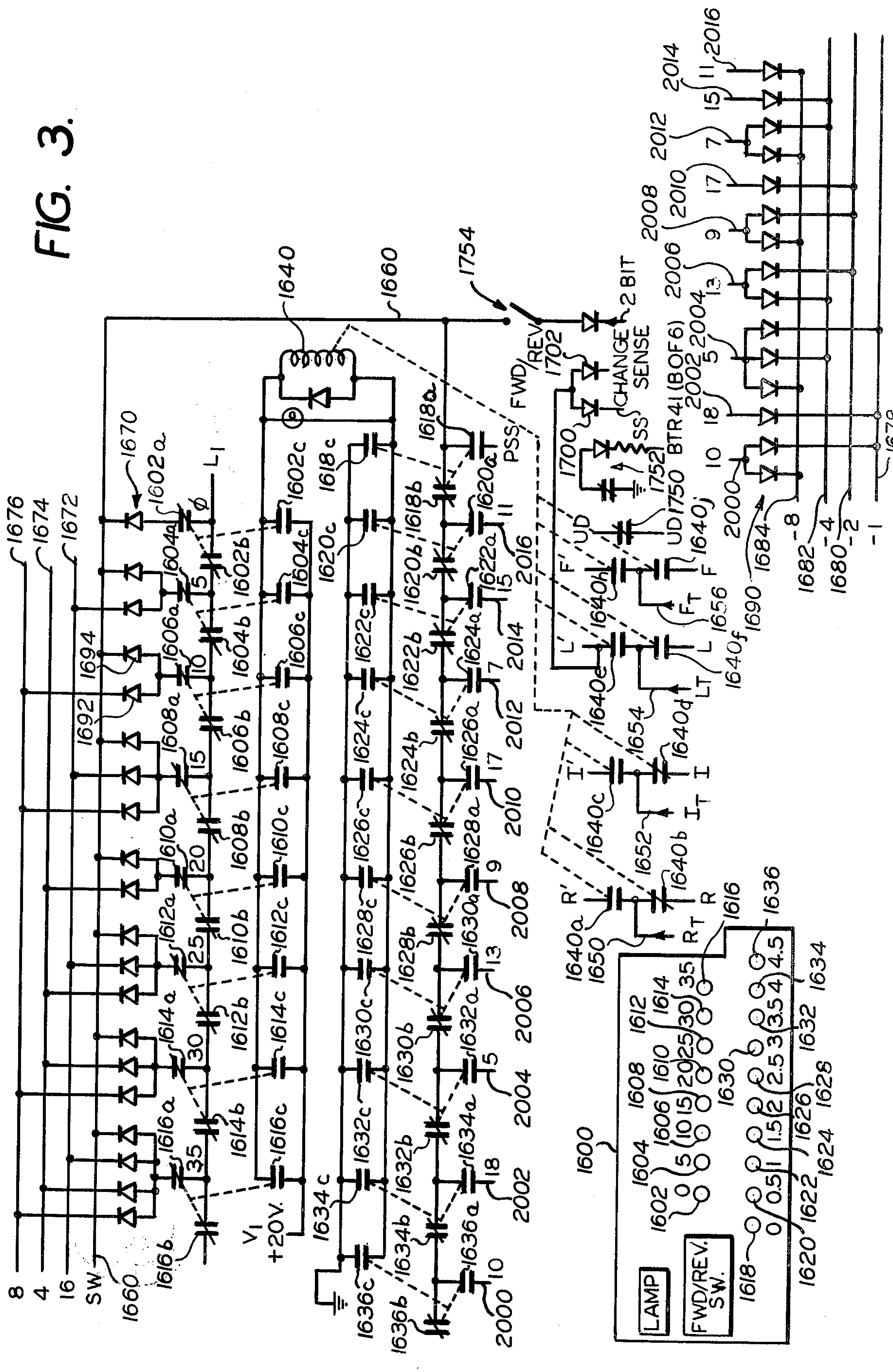

LAMP
FWD/REV. SW.
FWD/REV
2 BIT
CHANGE SENSE
BTR 41 (B OF 6)
PSS
+20V.
SW

FIG. 3.

FIG. 5.

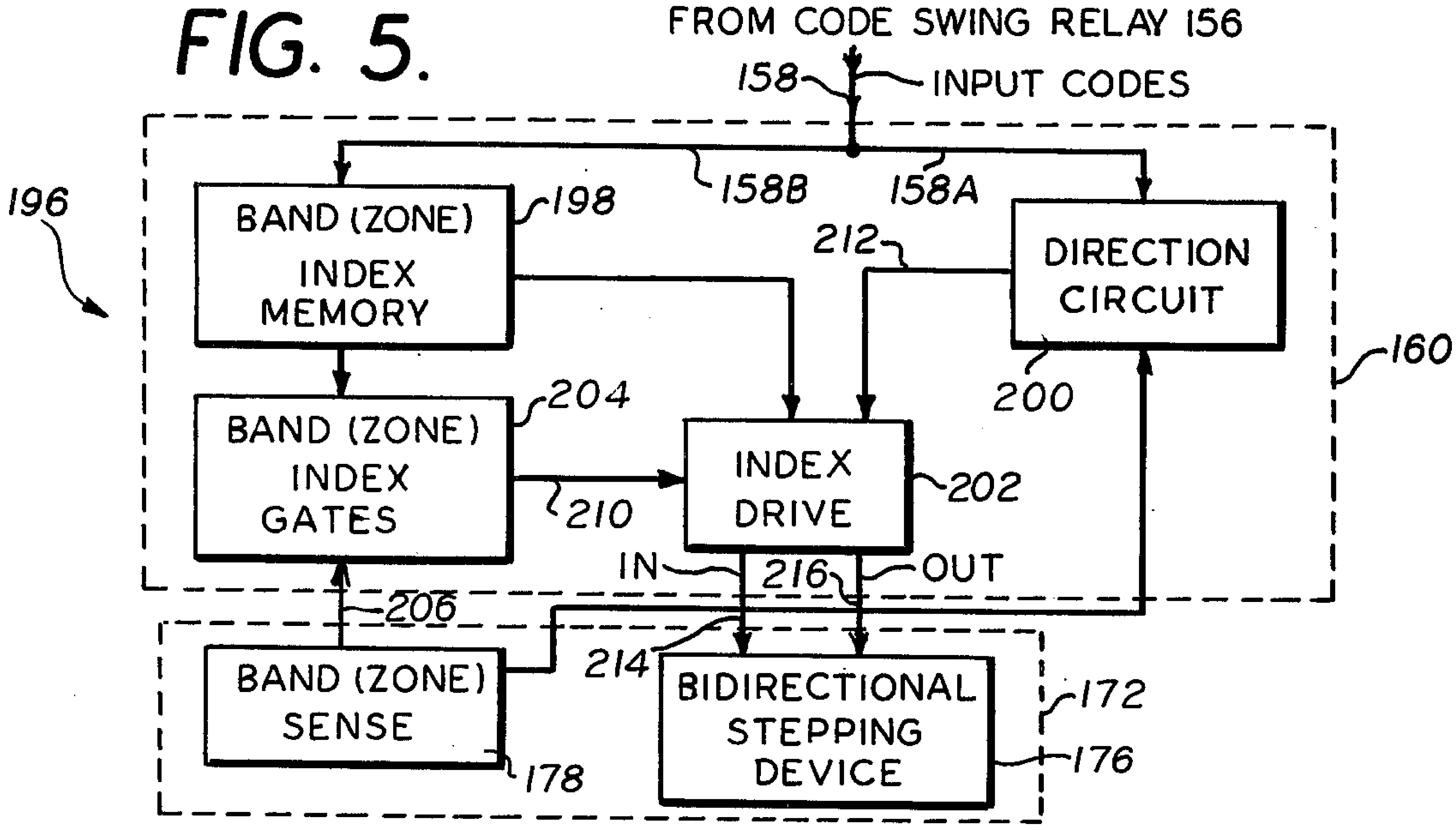
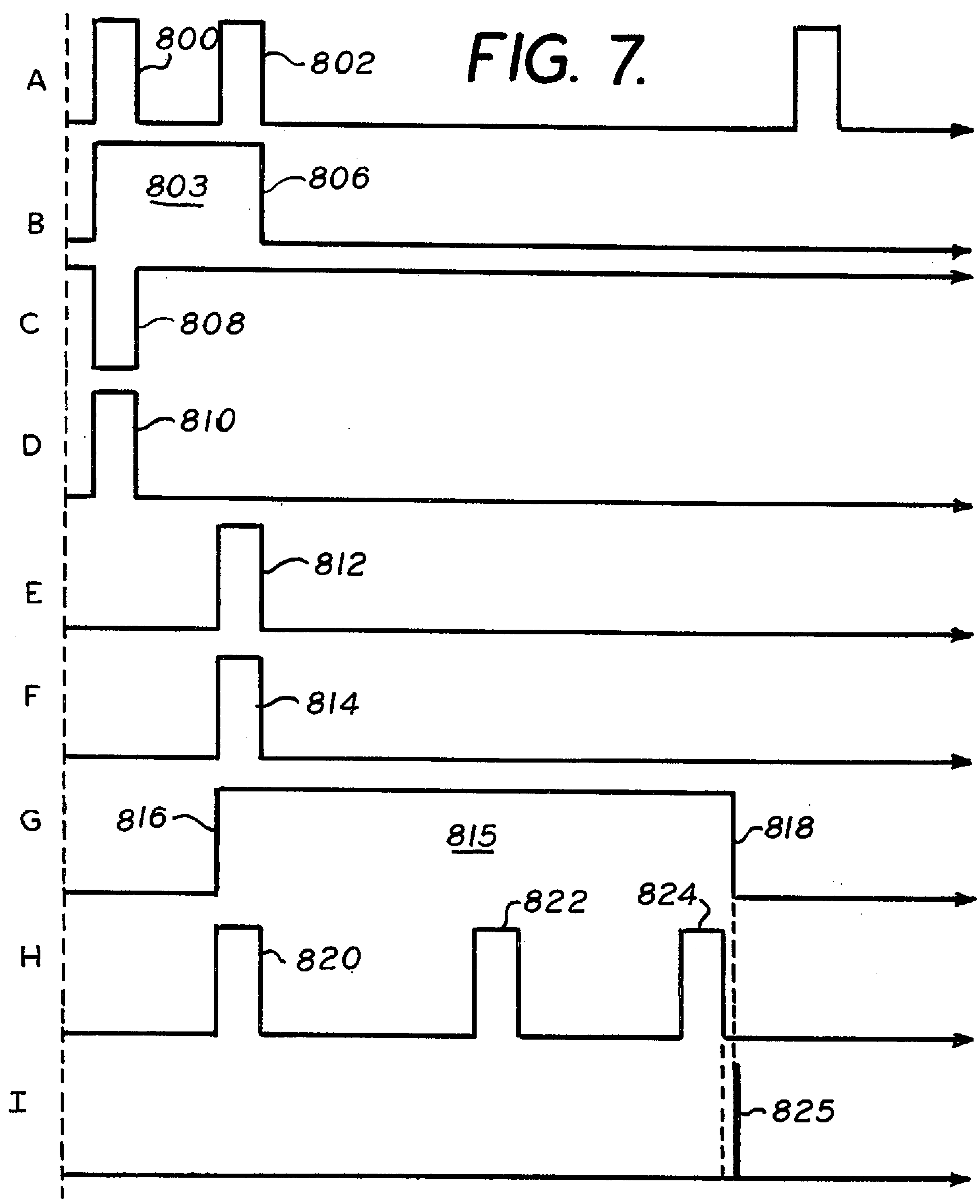

FROM CODE SWING RELAY 156
158
INPUT CODES
196
158B
158A
BAND (ZONE) INDEX MEMORY
198
212
DIRECTION CIRCUIT
160
200
BAND (ZONE) INDEX GATES
204
INDEX DRIVE
202
210
IN
216
OUT
206
214
BAND (ZONE) SENSE
178
BIDIRECTIONAL STEPPING DEVICE
172
176

FIG. 7.


A
800
802
B
803
806
C
808
D
810
E
812
F
814
G
816
815
818
H
820
822
824
I
825

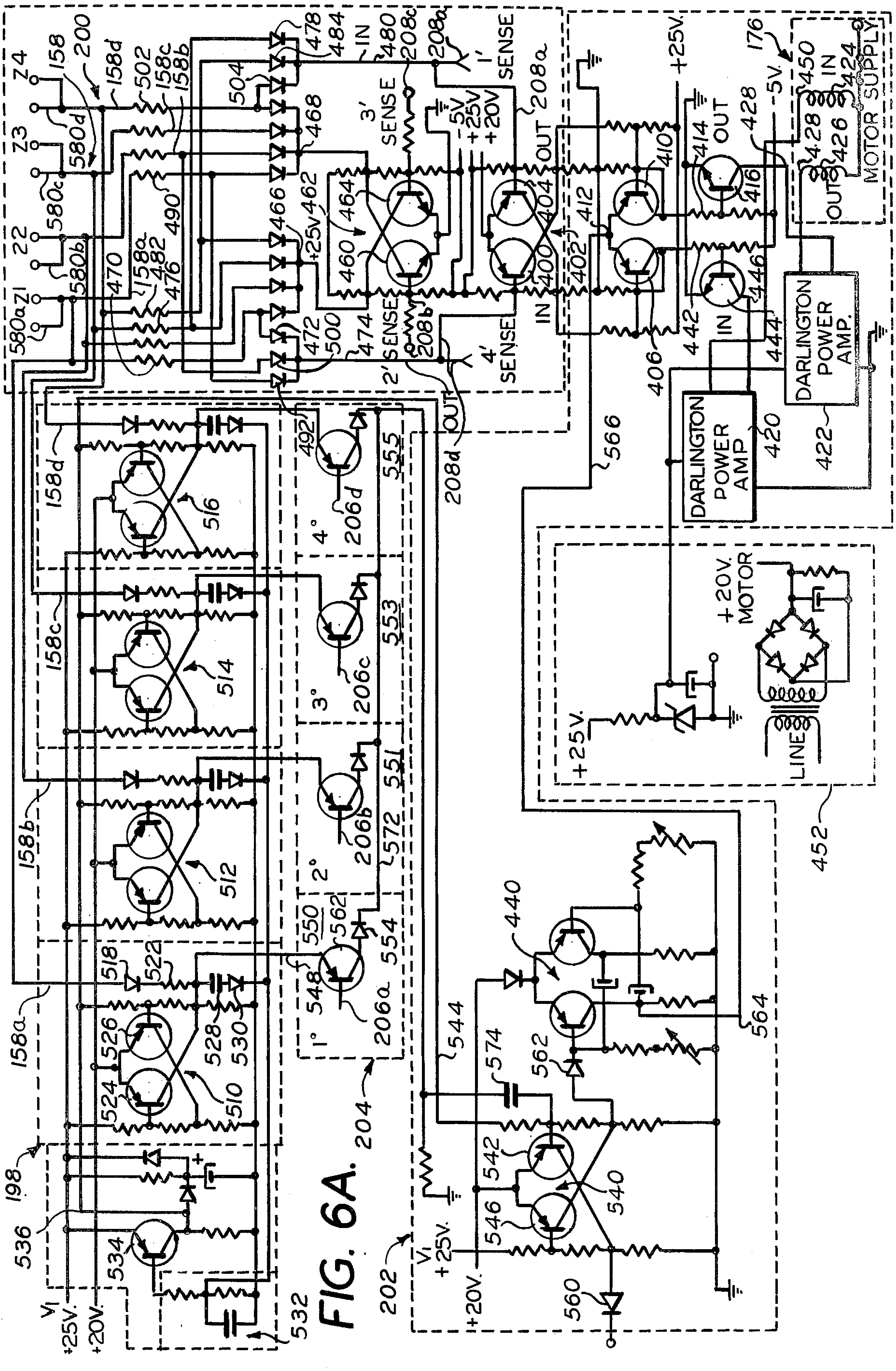


FIG. 6A.

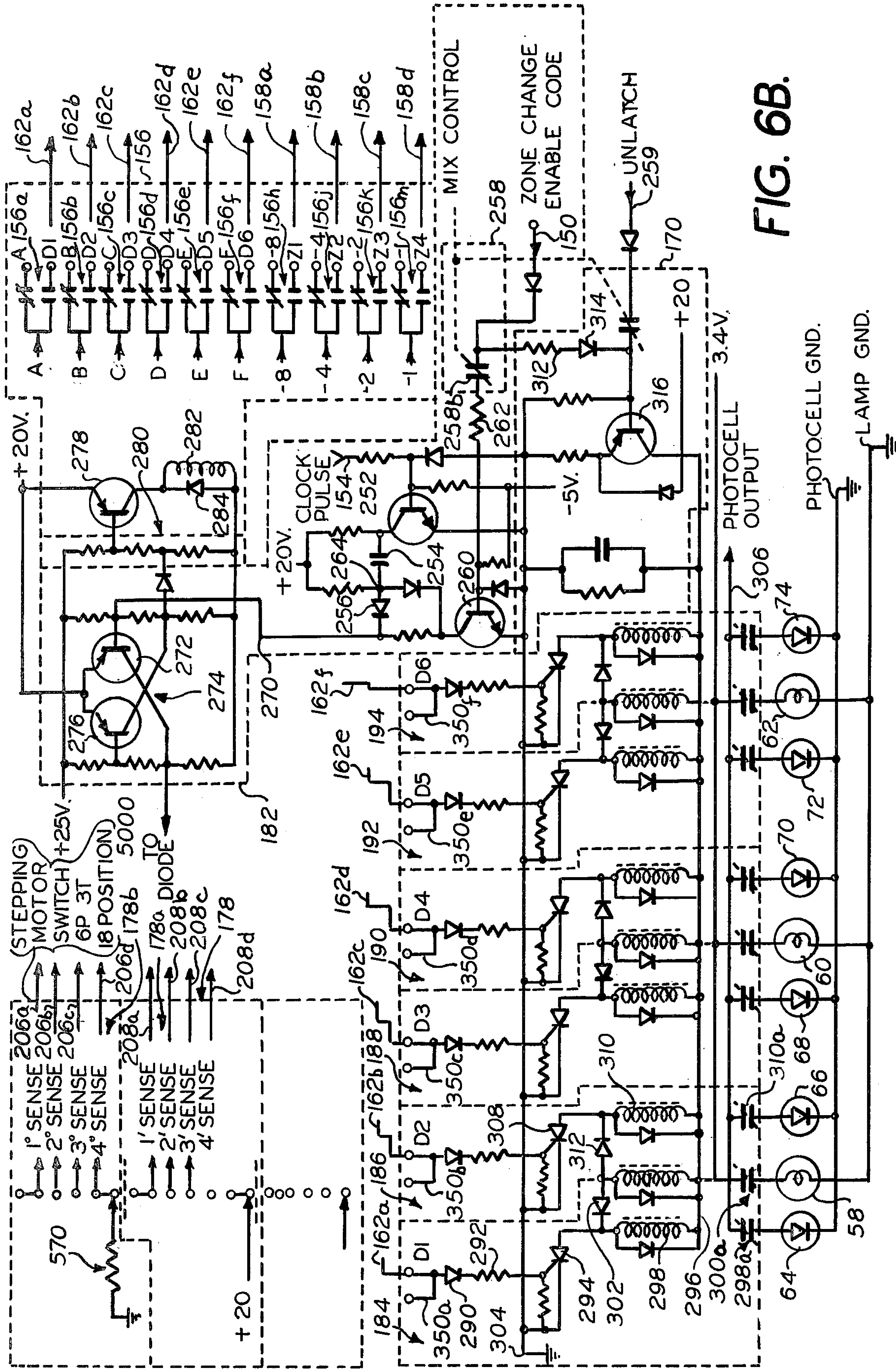

MIX CONTROL
ZONE CHANGE ENABLE CODE
UNLATCH
CLOCK PULSE
PHOTOCELL OUTPUT
PHOTOCELL GND.
LAMP GND.
(STEPPING MOTOR SWITCH) 6P 3T 18 POSITION 5000
TO DIODE
1° SENSE
2° SENSE
3° SENSE
4° SENSE
1' SENSE
2' SENSE
3' SENSE
4' SENSE
+20V.
+25V.
-5V.
3.4V.

FIG. 6B.

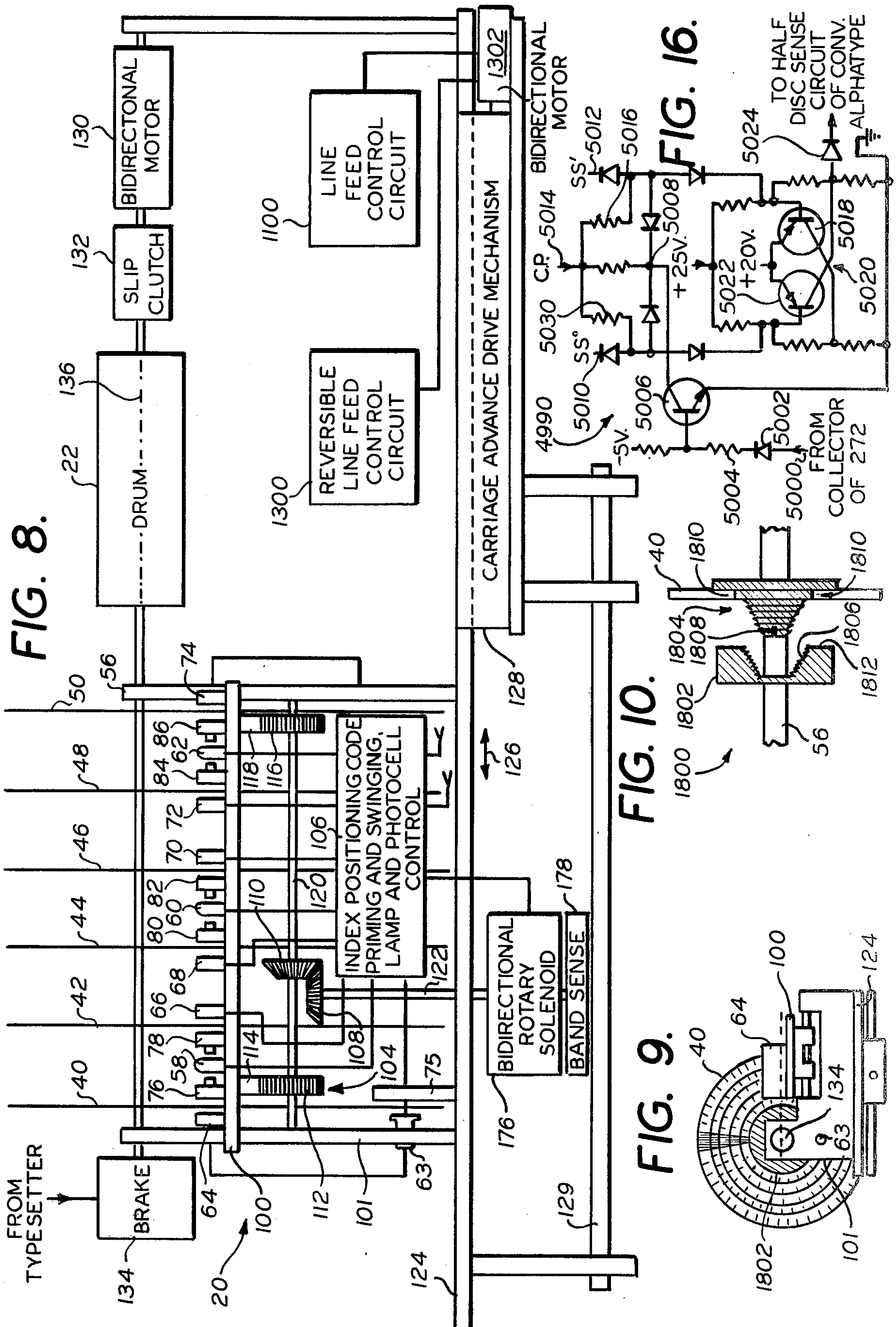


FIG. 8.

FIG. 9.

FIG. 10.

FIG. 16.

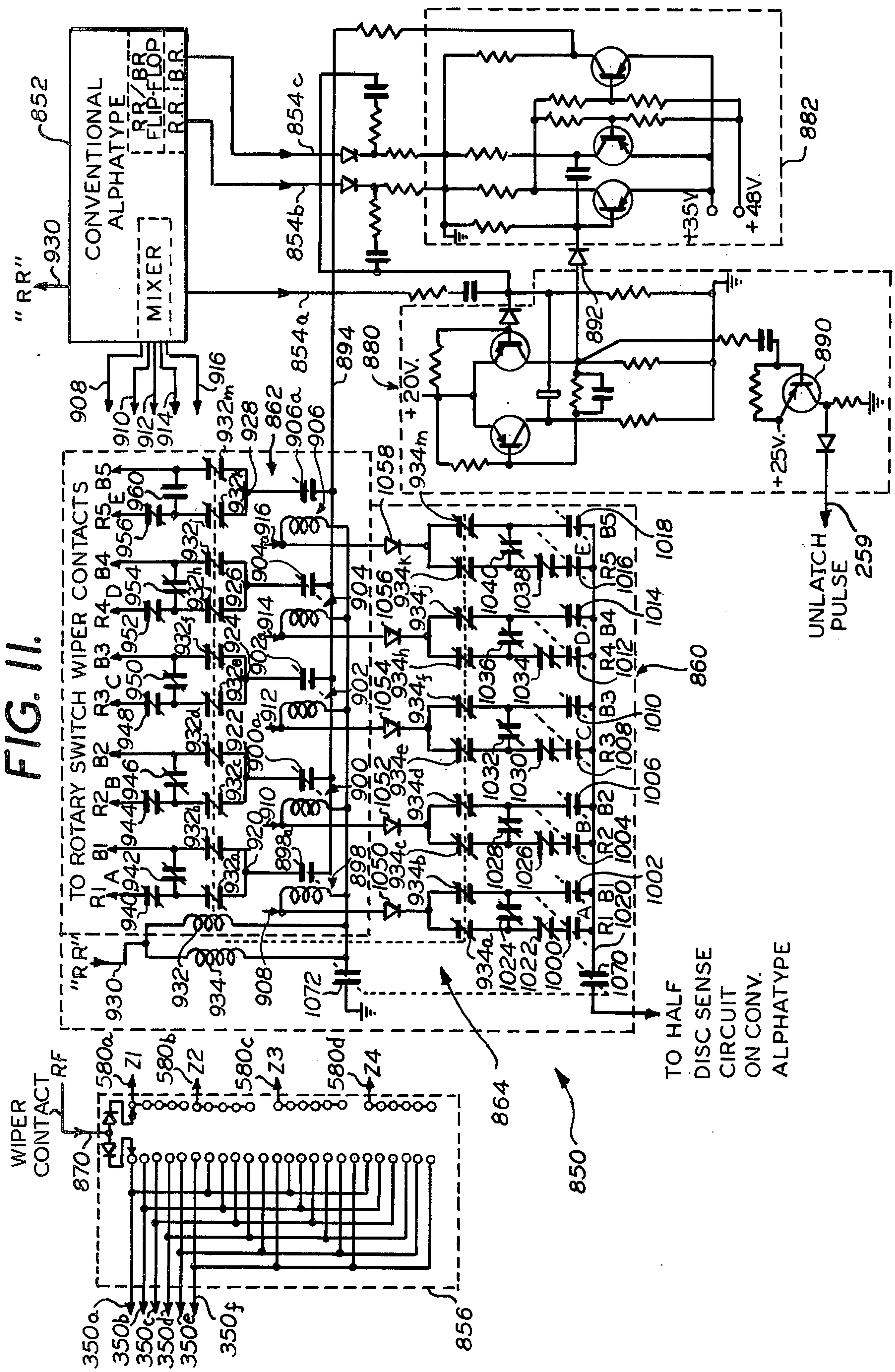

CONVENTIONAL ALPHATYPE
RR/BR FLIP-FLOP
MIXER
TO ROTARY SWITCH WIPER CONTACTS
WIPER CONTACT
UNLATCH PULSE
TO HALF DISC SENSE CIRCUIT ON CONV. ALPHATYPE
+35V
+48V.
+20V.
+25V.

FIG. 11.

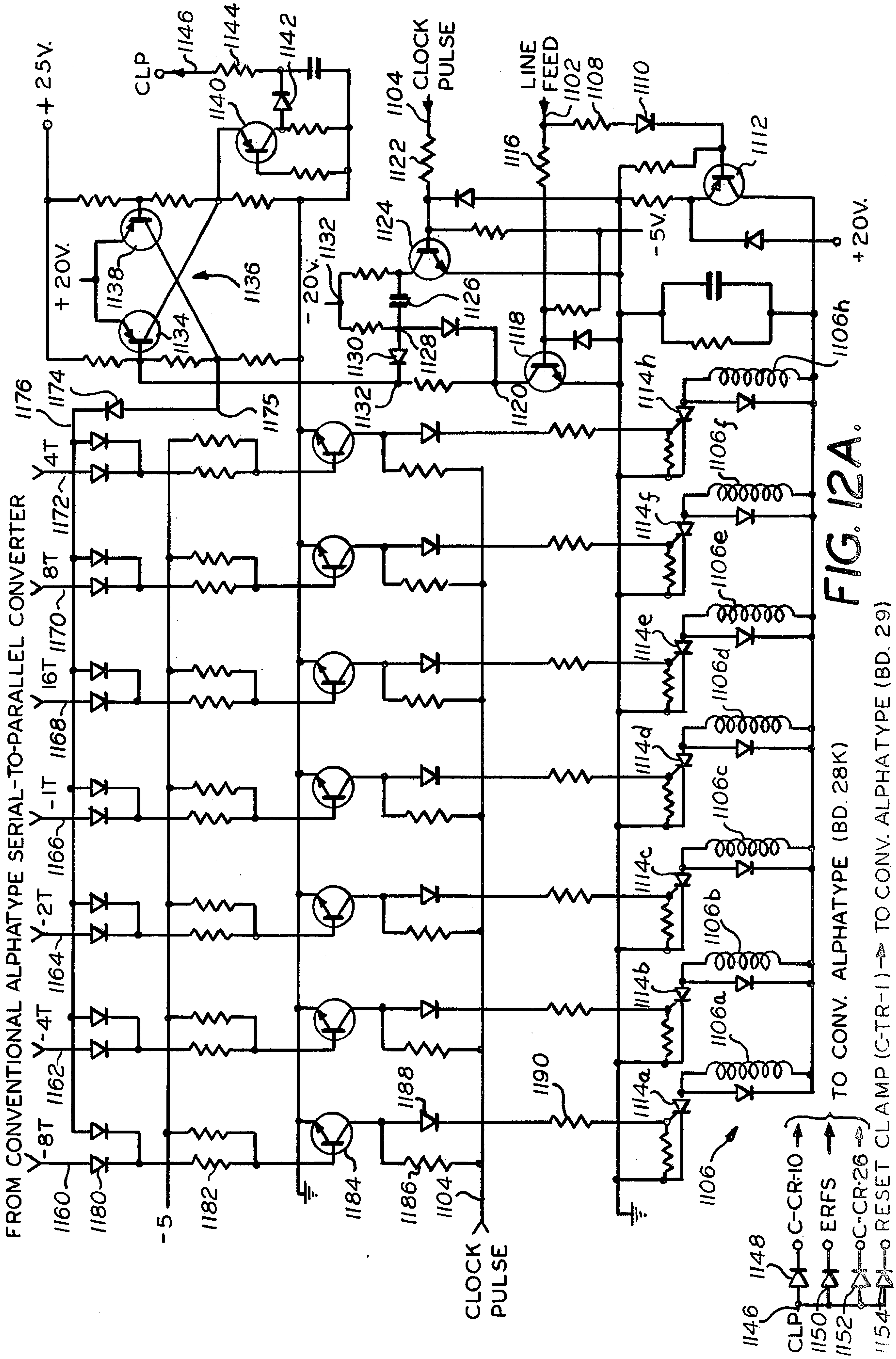
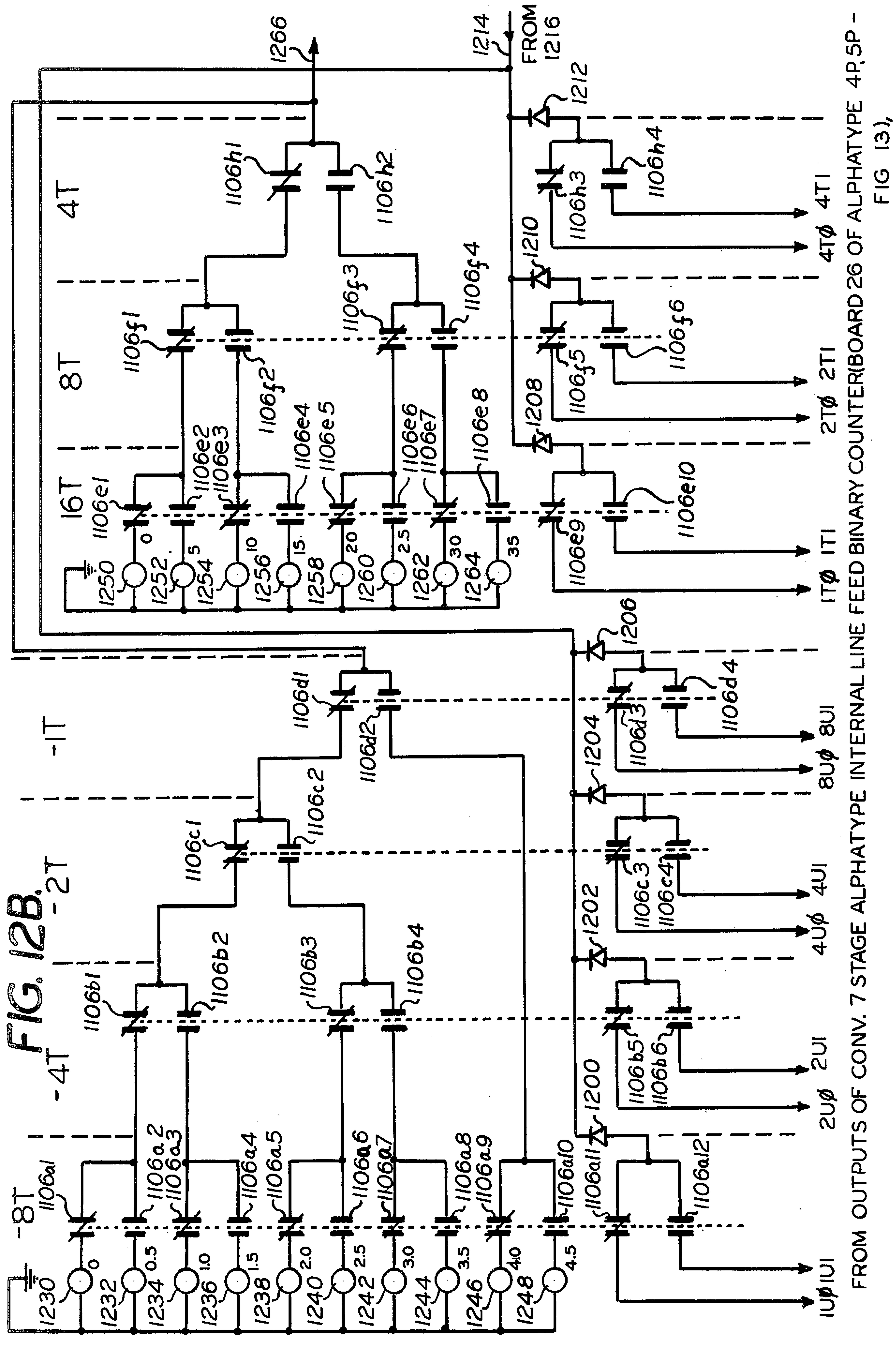

FROM CONVENTIONAL ALPHATYPE SERIAL-TO-PARALLEL CONVERTER
-8T
-4T
-2T
-1T
16T
8T
4T
+25V.
+20V.
-20V.
-5V.
-5
+20V.
CLP
CLOCK PULSE
LINE FEED
CLOCK PULSE
C-CR-10
ERFS
C-CR-26
RESET
TO CONV. ALPHATYPE (BD. 28K)
CLAMP (C-TR-1) → TO CONV. ALPHATYPE (BD. 29)

FIG. 12A.

FIG. 12B.


FROM 1216
1214
1266
FROM OUTPUTS OF CONV. 7 STAGE ALPHATYPE INTERNAL LINE FEED BINARY COUNTER(BOARD 26 OF ALPHATYPE 4P,5P - FIG 13),

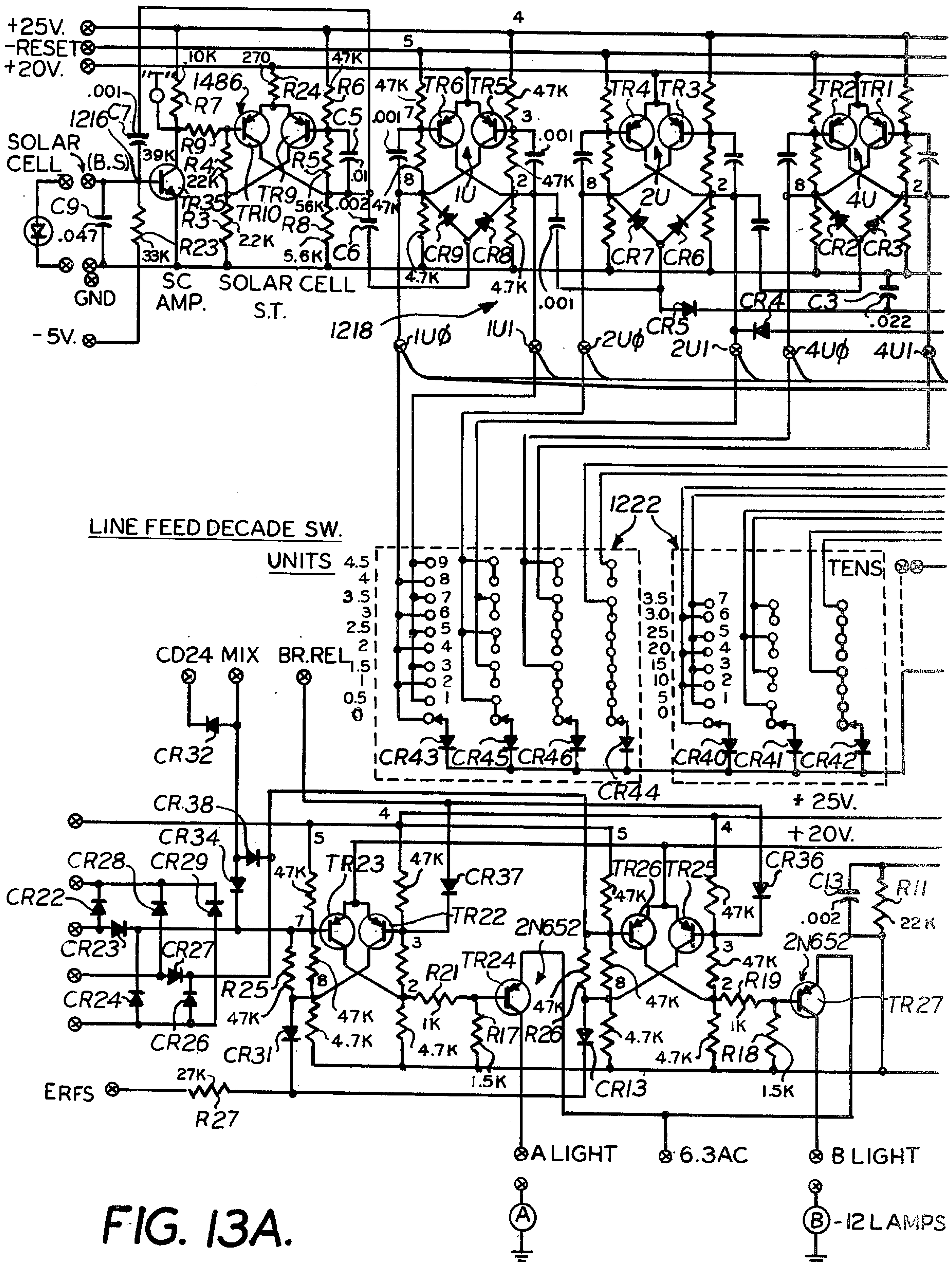

+25V.
-RESET
+20V.
SOLAR CELL
(B.S)
GND
-5V.
SC AMP.
SOLAR CELL S.T.
1216
1486
1218
1222
TR1
TR2
TR3
TR4
TR5
TR6
TR9
TR10
TR35
1U
2U
4U
CR2
CR3
CR4
CR5
CR6
CR7
CR8
CR9
C3
C5
C6
C7
C9
R3
R4
R5
R6
R7
R8
R9
R23
R24
1Uϕ
1U1
2Uϕ
2U1
4Uϕ
4U1
LINE FEED DECADE SW.
UNITS
TENS
CR40
CR41
CR42
CR43
CR44
CR45
CR46
CD24 MIX
BR.REL.
CR13
CR22
CR23
CR24
CR26
CR27
CR28
CR29
CR31
CR32
CR34
CR36
CR37
CR38
TR22
TR23
TR24
TR25
TR26
TR27
2N652
R11
R17
R18
R19
R21
R25
R26
R27
C13
ERFS
A LIGHT
6.3AC
B LIGHT
-12 LAMPS

FIG. 13A.

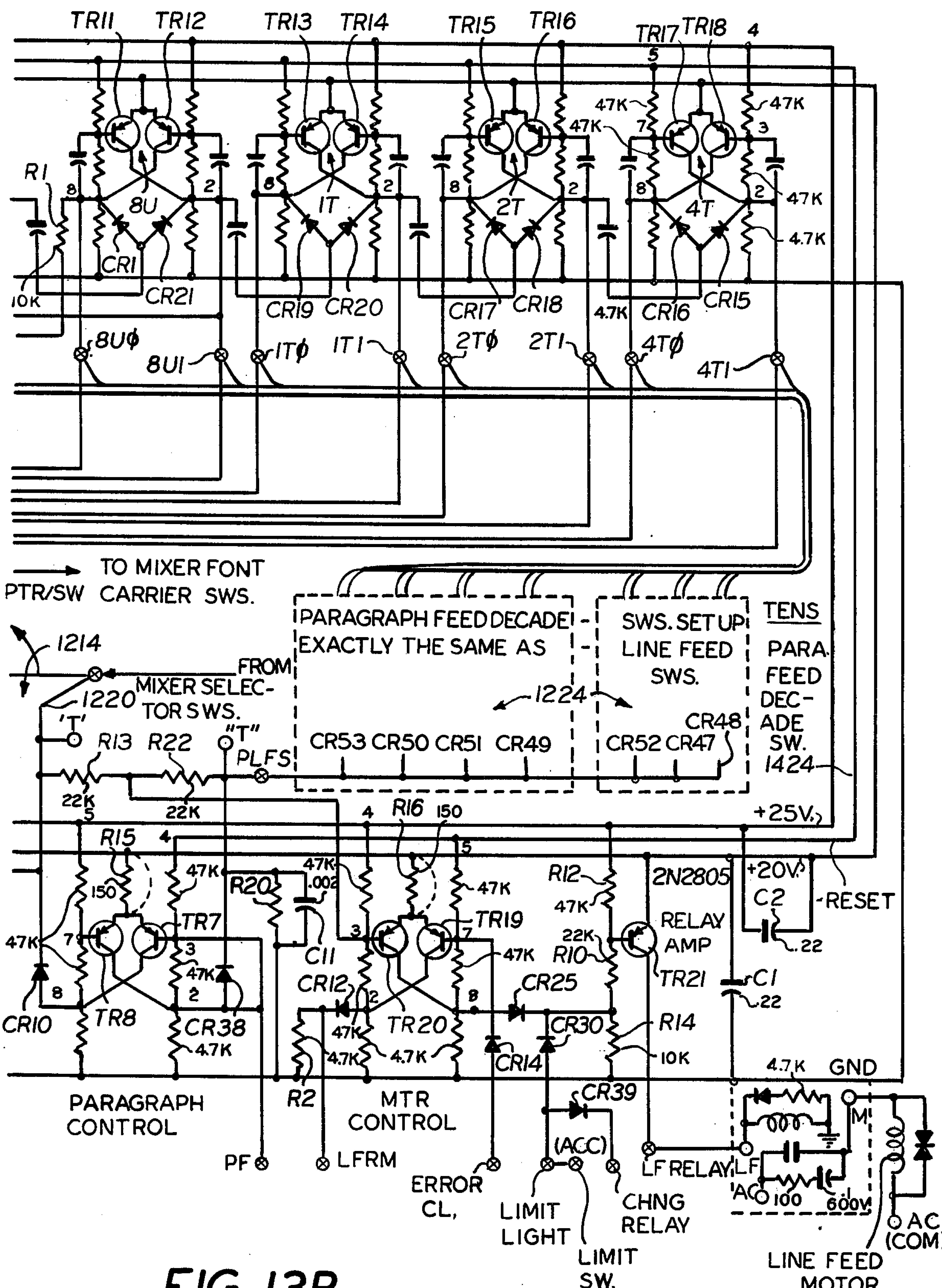

TR11
TR12
TR13
TR14
TR15
TR16
TR17
TR18
8U
1T
2T
4T
CR1
CR21
CR19
CR20
CR17
CR18
CR16
CR15
R1
10K
47K
4.7K
8U∅
8U1
1T∅
1T1
2T∅
2T1
4T∅
4T1
TO MIXER FONT CARRIER SWS.
PTR/SW
1214
1220
FROM MIXER SELECTOR SWS.
'T'
"T"
R13
R22
22K
PLFS
PARAGRAPH FEED DECADE EXACTLY THE SAME AS
SWS. SET UP LINE FEED SWS.
1224
CR53 CR50 CR51 CR49
CR52 CR47
CR48
TENS
PARA. FEED DECADE SW.
1424
+25V.
+20V.
C2
.22
RESET
R15
150
TR7
TR8
CR10
CR38
R20
.002
C11
R16
TR19
TR20
CR12
R2
CR14
CR25
CR30
R12
R10
22K
2N2805
RELAY AMP
TR21
R14
10K
C1
CR39
PARAGRAPH CONTROL
MTR CONTROL
PF
LFRM
ERROR CL.
(ACC)
LIMIT LIGHT
LIMIT SW.
CHNG RELAY
LF RELAY
LF
AC
100
600V
GND
M
AC (COM)
LINE FEED MOTOR

FIG. 13B.

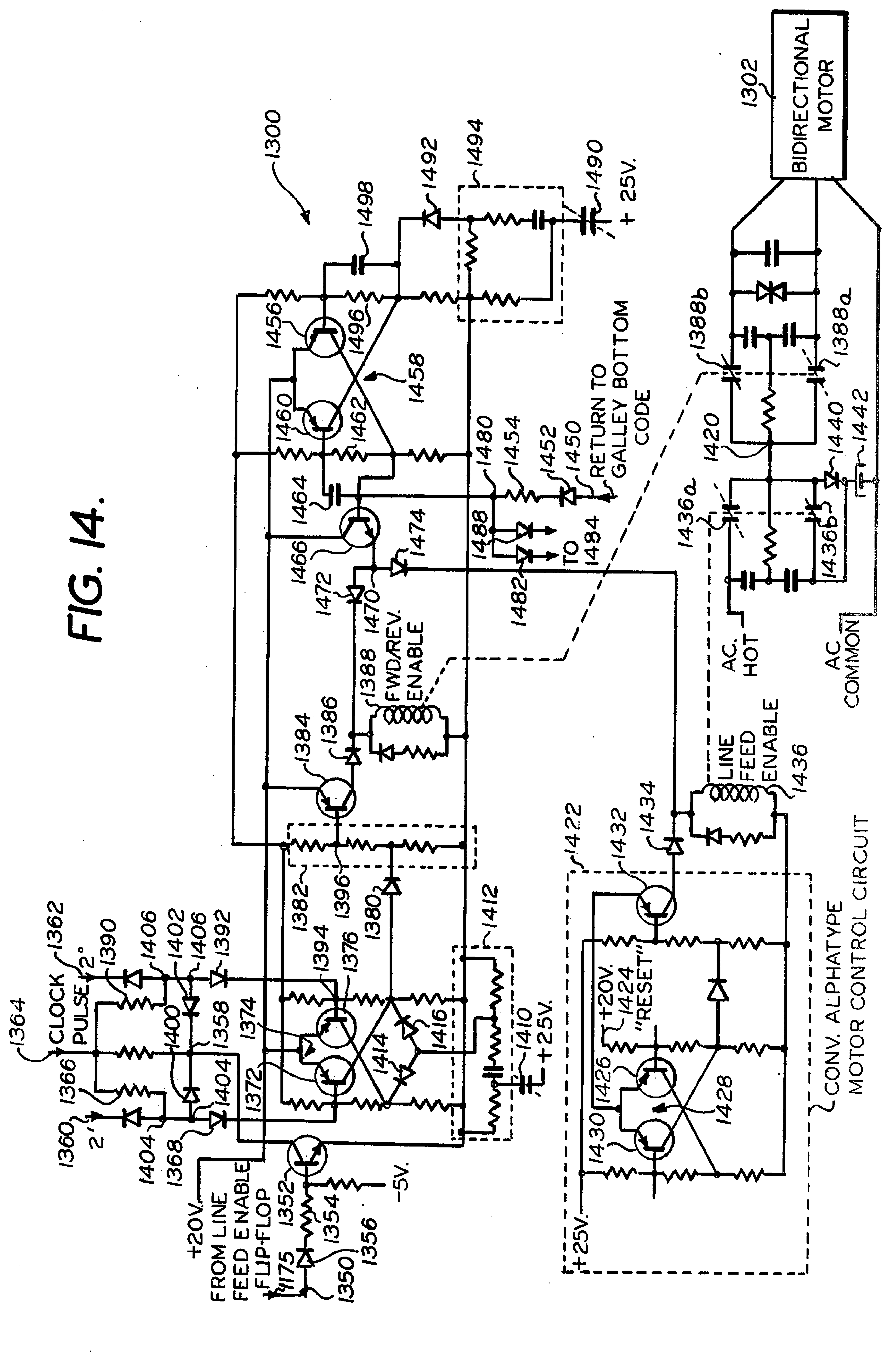
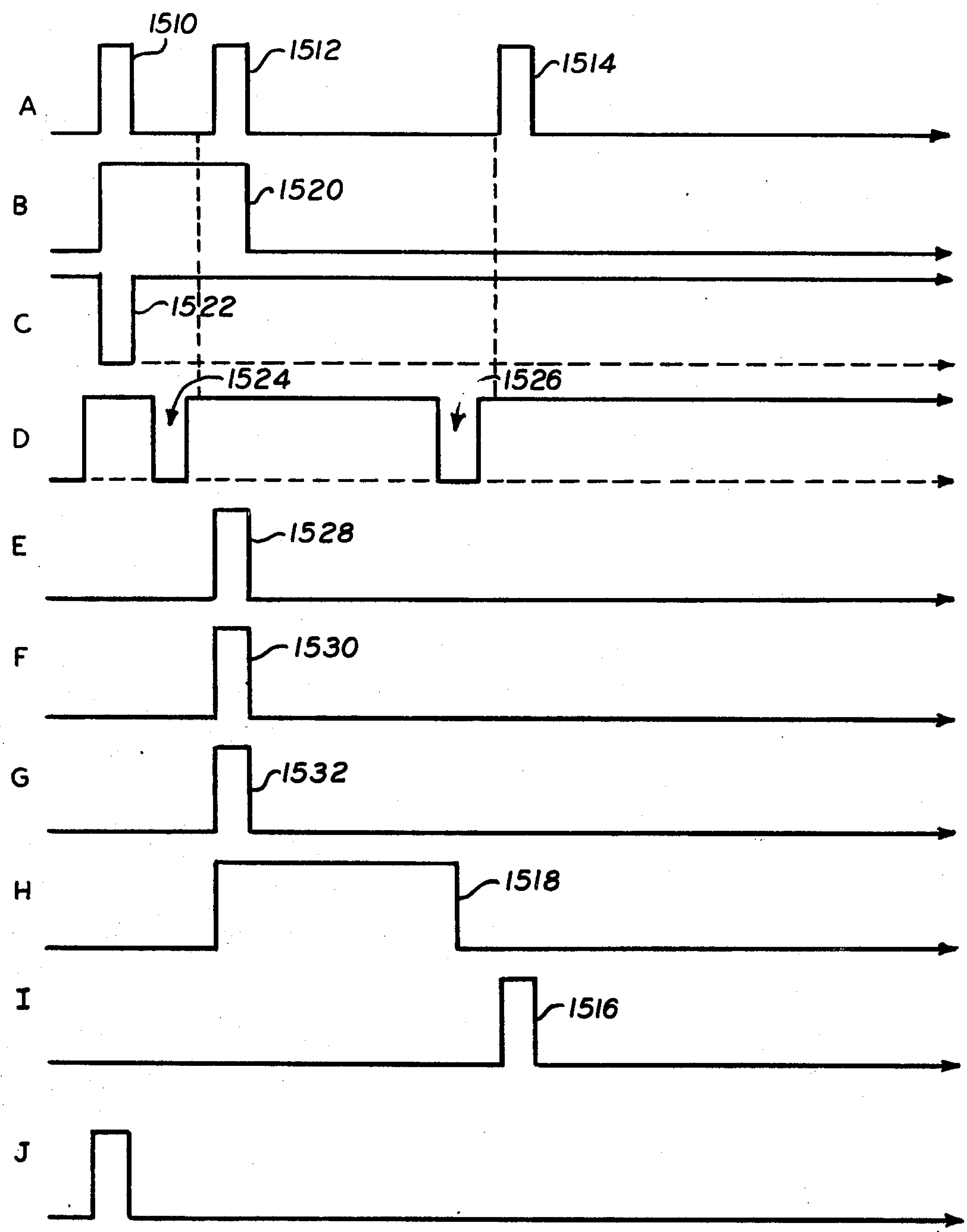

BIDIRECTIONAL MOTOR
1302
1300
RETURN TO GALLEY BOTTOM CODE
TO 1494
FWD/REV. ENABLE
AC. HOT
AC COMMON
LINE FEED ENABLE
CONV. ALPHATYPE MOTOR CONTROL CIRCUIT
"RESET"
+20V.
+25V.
+ 25V.
-5V.
CLOCK PULSE
2°
2'
FROM LINE FEED ENABLE FLIP-FLOP
1175
1350
1352
1354
1356
1358
1360
1362
1364
1366
1368
1372
1374
1376
1380
1382
1384
1386
1388
1388a
1388b
1390
1392
1394
1396
1400
1402
1404
1406
1410
1412
1414
1416
1420
1422
1424
1426
1428
1430
1432
1434
1436
1436a
1436b
1440
1442
1450
1452
1454
1456
1458
1460
1462
1464
1466
1470
1472
1474
1480
1482
1488
1490
1492
1494
1496
1498

FIG. 14.

FIG. 15.


1510
1512
1514
A
B
1520
C
1522
1524
1526
D
E
1528
F
1530
G
1532
H
1518
I
1516
J

DRUM CONTROL SYSTEM

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to systems for controlling the provision of a predetermined space on a drum surface.

2. Description of the Prior Art

Systems for providing control of the line feeding and lateral spacing of a drum, such as a conventional drum utilizable in a conventional phototypesetting system, such as the type provided with the Alphasette or the Alphatype **4p** or **5p** incremental phototypesetting system, manufactured by Alphatype Corp. of Skokie, Illinois and, described, by way of example in U.S. Pat. No. 2,905,068, are well known. In such an arrangement, the drum is normally keyed to a common shaft with a lateral spacing control composite disc which conventionally contains four circumferential radially spaced apart bands, with each of the bands being circumferentially divided into a plurality of transparent windows spaced apart by opaque areas which are normally and preferably equal in size to the transparent windows which are optically read by a single light source in combination with a single photocell. In such a conventional arrangement, the discs each have different available disc sizes which determines the spacing, that is the lateral movement of the drum in a given line with these disc sizes being conventionally established to provide eighteen different sizes or lateral space widths for phototype setting, such as a 9½ disc, a 15 disc, or an 18 disc, by way of example. The appropriate disc size or set size for a given job is dependent on the type font selected for the particular image and the physical appearance desired by the photocomposer. In addition, in such prior art phototype setting systems, such as the Alphatype or Alphasette, a full disc mode and a half disc mode is conventionally provided with a full disc unit and full disc mode being defined as an opaque area plus a clear area and, in the half disc mode, the opaque area also being counted so that a half disc unit is equivalent to either an opaque area or a clear area. Thus, by way of example, a **15** disc size could be utilized to also provide equivalent spacing obtainable from a 7½ disc by utilizing a **15** disc in the half mode. As was previously mentioned, these discs are conventionally optically read by a conventional lamp and photocell arrangement to provide information to conventional counting circuitry. In such a prior art arrangement in which each of the discs is normally provided with only two zones or bands of different sizes, 240 different distinctive discs are now presently utilized to provide all of the requisite combinations to provide the normally utilized **18** zones or bands for phototype setting. Thus, prior to initating the job, with the prior art systems, the user physically selects and mates the discs, one on top of the other, which would be required to provide all of the zones required for a given job and then mechanically selects the proper zones or bands to be optically read by position setting on a rotary switch. Such a prior art arrangement does not readily allow for flexibility or changes during the course of the job. Thus, with respect to the rotary switches, such as the type utilized to manually select line feed, as well as the above, the rotary switch bank utilized for line feed selection is normally fixed for the job and cannot be changed unless the job is halted and the switch is manually changed and, accordingly, can-

not be continuously varied throughout the job, such as dynamically by means of a computer to provide a programmable line feed. Other prior art lamp-photocell drum control circuits, by way of example, are described in U.S. Pat. Nos. 2,989,904; 3,726,193; 2,736,249; 3,602,116; 3,307,459; 3,357,327; 3,464,331, 2,780,151; 3,274,909; 3,450,014; and 3,138,803. These systems, however, once again, do not provide a satisfactory flexible system in which the, by way of example, the number of optically readable discs required for drum control is minimized while the number of possible different disc or set sizes corresponding to different lateral spacing increments is maximized. These disadvantages of the prior art are overcome by the present invention.

SUMMARY OF THE INVENTION

A drum control system is provided for providing a predetermined incremental lateral spacing on a drum surface to be accessed in response to a request signal therefor. The system includes a motor for rotatably driving the drum about the longitudinal axis thereof as well as a control network for controlling the degree of rotation of the drum in response to the request signal to provide a predetermined incremental lateral spacing. Such rotation is controlled in accordance with a plurality of optically readable encoded discs, each of the discs having a plurality of radially spaced apart circumferentially extending bands, each band comprising a plurality of optically readable sense marks, with the discs being coaxially rotatably mounted for simultaneous incremental rotation with the drum in response to the request signal. Each of the sense marks in a given band corresponds to a predetermined uniform proportionate degree of incremental rotation of the drum and each of the disc circumferential bands is encoded to correspond to a different uniform proportionate degree of incremental rotation of the drum. The discs are preferably arranged in pairs spaced apart from each other with correspondingly equally radially spaced bands optically aligned with each other, a common light source preferably being mounted so as to be optically common with both discs of the pair and optically alignable for illumination of the bands when energized. In addition, each disc preferably has an associated optical reader, such as a photocell, optically aligned with the common light source and associated therewith and being selectively energizable and responsive to the sense marks on whichever associated band the optical reader is aligned with at a given time when the optical reader is selectively energized and the common light source illuminates this band for providing an output signal indicative of the proportionate degree of incremental rotation of the disc. The control network includes gating and relay circuitry for substantially simultaneously selectively energizing the optical reader associated with the disc band corresponding to the requested incremental lateral spacing and the common light source associated therewith in respone to the request signal by enabling the appropriate gating-relay network associated with the requisite light source-optical reader combination. The system also includes a brake operatively connected to the drum drive for halting the rotatable drive of the drum in response to a braking signal which is provided from a comparator which receives the request signal and the selectively energized optical reader output signal to provide the braking signal to the brake when the selectively energized optical reader output signal corresponds to the requested incremental lateral spacing. A first common incrementally movable platform is provided on which the light sources and the associated optical readers are mounted for simultaneous movement therewith, each of the light sources and optical readers being optically aligned with a common radial location on the disc so as to simultaneously access a common radial radially location on the disc. This light-source-photocell platform has a plurality of incremental index positions, one being associated with each of the radially located bands on the disc, in which the associated light source and optical reader are commonly optically aligned with the band located at each of these incremental index positions. A control circuit is provided for controlling the indexing or incremental movement of this platform to align the associated optical reader-light source with the band corresponding to the requested incremental lateral spacing for the drum in the shortest time by sensing the initial position of the platform and determining the direction and movement of the platform toward the incremental index position corresponding to the requested band to be read in the shortest time which is defined as the optimum minimum number of steps. This light source-photocell platform and the drum are also preferably commonly mounted on a second incrementally movable platform for simultaneous movement therewith with this other common platform being axially incrementally movable, preferably bidirectionally, in the direction of the longitudinal axis of the drum by means of a programmable relay network in conjunction with a bidirectional motor for incrementally axially moving this other common platform in response to a request signal for a different predetermined axial position on the drum surface relative to a fixed access location. Dynamic braking may be employed to halt the movement of this other common platform by dynamically braking the bidirectional motor, such as by providing the dynamic braking signal from a capacitor which charges only during axial advance of the drum when the motor is in the forward direction and only discharges to provide the dyanmic braking signal, having a predetermined duration, to the motor dependent on the discharge time constant when the programmed axial advance or line feed has been completed. Accordingly, any desired line feed may be programmed and may be dynamically varied during the course of a given job. This axial advance or line feed may be reversed in response to the receipt of a predetermined code signal and, the bidirectional motor may once again be returned to the forward direction when the drum axial position reaches a predetermined location.

The previously mentioned indexing light source-photocell platform is preferably incrementally advanced by means of a bidirectional rotary solenoid combination in conjunction with a rotary-to-linear conversion gearing arrangement, such as beveled gears and a rock-and-pinion arrangement, to incrementally advance the light source-photocell platform. With respect to the incremental movement of the other platform, a carriage advance device is preferably operatively connected to the platform for axially incrementally moving it in a predetermined axial direction with the bidirectional motor driving the carriage advance in a predetermined direction dependent on the state of the motor, and with the gating-relay network associated with this bidirectional motor capable of dynamically incrementally varying the quantity of incremental axial movement of this platform for controlling the operation thereof in response to the dynamically variable request signal for a different predetermined axial position of the drum relative to a fixed access location so that line feed to the drum may be dynamically varied in accordance with a dynamic variation in the axial position request signal. The line feed or axial position control circuitry is preferably readily interfaceable with a conventional phototypesetting system, such as a conventional Alphatype **4p** or **5p** for replacing the normally provided rotary switch bank which provides a preset fixed line feed or axial advance as opposed to a dynamically variable or programmable line feed or axial advance.

Preferably, the control signals utilized by the line feed or axial advance control circuitry of the present invention, as well as the light source-photocell direction circuitry and platform indexing control circuitry, are provided by signals which are predetermined coventional phototypesetting code signals which have been swung so as to render the system readily interfaceable with a conventional phototypesetting system, such codes preferably being provided from a relay network attachment for a conventional phototypesetting recorder, such as an Alphatype recorder. The previously mentioned discs which are preferably spaced apart by a predetermined amount and coaxially mounted to a common shaft in a fixed axial position thereon for simultaneous rotation therein, are preferably movably mounted on the shaft by disc clamps which include a threaded socket slidable on the shaft and an insertable threadable member having a resilient threadable portion threadably insertable into the socket and a mounted portion for the associated disc with the resilient portion being slidable on the shaft prior to insertion of the threadable portion in the socket and being squeezed to tighten against the shaft as it is threaded into the socket for preventing slidable movement therealong when the member has been threaded into the socket to fix the clamping means at a predetermined axial location with the width of the clamp preferably enabling the desired predetermined axial spacing between adjacent discs to be obtained whereby the clamping of the disc simultaneously enables the predetermined axial spacing as well as the securing of the disc to the shaft in its predetermined axial location.

BRIEF DESCRIPTION OF DRAWINGS

FIG. **1** is a system block diagram of the preferred embodiment of the lateral spacing selection system of the present invention;

FIG. **2** is a detailed block diagram of the code priming circuit and lamp and photocell control circuitry of the embodiment shown in FIG. **1**;

FIG. **3** is a schematic diagram of a conversion circuit for use with a conventional phototype setting code recorder for converting standard key strokes to those utilizable with the reversable line feed control circuit of FIG. **14**;

FIG. **4** is a diagrammatic illustration of a typical disc for use with the arrangement of FIG. **8**;

FIG. **5** is a more detailed block diagram of the index positioning circuit portion of the system shown in in FIG. **1**;

FIGS. **6A** and **6B** comprise a schematic of the system of FIG. **1**;

FIG. **7** is a timing diagram illustrative of the operation of the system of FIG. **1**;

FIG. **8** is a diagrammatic illustration of a photocomposition material carrier lateral spacing system employing the system shown in FIG. **1** and further illustrating the preferred mechanical system employed with the system of FIG. 1;

FIG. 9 is an end view taken from the left side of the system of FIG. 8;

FIG. 10 is a fragmentary sectional view of a preferred disc clamp utilizable with the system of FIG. 8;

FIG. 11 is a schematic diagram of a preferred rotary switch control arrangement utilizable with the system of FIGS. 6A and 6B in the manual control mode;

FIGS. 12A and 12B comprise a schematic diagram of a preferred programmable line feed control circuit utilizable with a conventional line feed counter of the type shown in FIG. 13 for controlling the line feed of the system illustrated in FIG. 8;

FIGS. 13A and 13B when taken together as FIG. 13 is a schematic diagram partially in block of a typical conventional line feed counter;

FIG. 14 is a schematic diagram of the preferred embodiment of a reversable line feed control circuit utilizable with the programmable line feed of FIG. 12 and the manual line feed of FIG. 13 for the phototype setting system arrangement illustrated in FIG. 8;

FIG. 15 is a timing diagram illustrative of the operation of the reversable line feed circuit illustrated in FIG. 14, and

FIG. 16 is a schematic diagram of the preferred embodiment of a disc mode control network in accordance with the present invention.

DETAILED DESCRIPTION OF THE PREFRRED EMBODIMENT

"GENERAL DESCRIPTION"

Referring now to the drawings in detail, and initially to FIG. 8 thereof, a diagrammatically illustration of the preferred system, generally referred to by the reference numeral 20, of the present invention for providing control of the line feeding and lateral spacing of a drum 22, such as a conventional drum utilizable in conventional incremental phototypesetting, such as the provided with the Alphatype 5p phototypesetting system, manufactured by Alphatype Corp. of Skokie, Illinois wherein a photosensitive material, such as a photosensitive film, is circumferentially wrapped about the longitudinal axis of the drum 22 for exposure to selected type font faces to produce a printing master. This exposure is accomplished in conventional fashion in the Alphatype by flash lamp exposure, such a conventional system being described, by way of example, in U.S.

Pat No. 2,905,068. In such an arrangement, as will be described in greater detail hereinafter, the drum or cylinder 22 upon which the photosensitive tape or film carrier is selectively positioned for exposure of a image at a predetermined relationship to the previous image, is normally keyed to a common shaft with a spacing disc, such as disc 24 illustrated in FIG. 4. Such a disc 24 represents a composite disc which conventionally contains four circumferential bands, such as bands 26, 28, 52 and 54 illustrated in FIG. 4 with each of the bands being circumferentially divided into a plurality of transparent windows 30 spaced apart by opaque areas 32 which are normally and preferably equal in size to the transparent windows 30. In addition, the composite disc 24 conventionally has an opaque area 34 which conventionally enables proper registration of the disc 24 as well as a right index margin window 36 for proper registration of the disc 24 with the drum 22. As will be described in greater detail hereinafter, the preferred disc of the present invention has the right index margin window 37 preferably located in the position illustrated in FIG. 4.

As is well known, in photocomposition employing phototypesetting, the film carrier or drum 22 is preferably divided into 75 picas, such as in the previously mentioned Alphatype. In such a conventional arrangement, the discs 24 each have different available disc sizes which determine the spacing, that is the lateral movement on the drum in a given line, between adjacent images in a photoexposed line of type. These discs sizes are conventionally established to provide 18 different sizes, or lateral space widths, presently, such as the $9\frac{1}{2}$ disc, a 15 disc, or an 18 disc, by way of example. The appropriate disc size or set size for a given job is dependent on the type font selected for the particular image and the physical appearance desired by the photocomposer. This diss size or set size is conventionally calculated in accordance with the formula 75 picas $\times$ 216 (which is a constant) is equivalent to the disc size or set size so that the number of units on a disc is conventionally equivalent to 16,200 divided by the disc size. In addition, it is conventionally recognized that one pica equals 12 points and the number of picas multiplied by 216 provides a quantity, which when divided by the set size, is equivalent to the number of incremental units on a disc, with the number of units on a disc normally be defined as the number of clear areas 30 on a disc 24 those units contained with opaque registration area 34.

The Alphatype, by way of example, conventionally provides a full disc mode and a half disc mode. In the full disc mode, a full disc unit to be counted is defined as an opaque area 32 plus a clear area 30, the number of clear areas being equivalent to the number of windows; whereas in the half disc mode, the opaque areas 32 are also counted so that a half disc unit is equivalent to either an opaque area 32 or a clear area 30. In this arrangement, by way of example, a 15 disc size could be utilized to also provide the equivalent spacing obtainable from a $7\frac{1}{2}$ disc by utilizing the 15 disc in the half mode. These discs 24 are conventionally optically read by a conventional lamp and photocell arrangement to provide information to conventional counting circuitry, such as commonly provided in a conventional Alphatype photocomposing device, such as the Alphatype 4p.

In such a conventional arrangement, each of the discs 24, as previously mentioned, is normally provided with only two zones or bands 26 and 28 of different sizes and, conventionally, 240 different distinctive discs are now presently utilized to provide all of the requisite combinations to provide the normally utilized 18 zones or bands. In such a conventional arrangement, prior to initiating the job, the user physically selects and mates the discs, one on top of the other, which would be required to provide all of the zones required for a given job and then mechanically selects the proper zones or bands to be optically read by position settings on a rotary switch, to be described in greater detail hereinafter. Such an arrangement does not readily allow for flexibility or changes during the course of the job. The preferred arrangement illustrated in FIG. 8, however, utilizes a plurality of fixed optically readable discs 40, 42, 44, 46, 48, and 50, each similar to the type illustrated in FIG. 4, to provide all of the possible combinations of zones or bands to provide all of the presently desired set sizes, with only disc 40 containing the right index margin window 36. In addition, since six discs 40 through 50, inclusive, are utilizes, 24 zones or bands, in the present example, may be selected where, as presently preferred, four bands, such as bands **26, 28; 52** and **54** illustrated in FIG. **4** on disc **24**, are provided per disc. Of course, if desired more than four bands may be provided per disc with appropriate obvious modifications in the indexing and positioning circuitry, to be described in greater detail hereinafter, so that the number of zones or bands which may be provided is any desired amount. In addition, although the presently preferred arrangement utilizes six such discs **40** through **50**, inclusive, any other plurality of discs may preferably be provided on a common shaft **56** is desired. Thus, all of the discs **40** through **50**, inclusive, are preferably keyed to the common shaft **56** which is also common to the drum **22** which rotates therewith so as to provide lateral image spacing for a given line on the drum **22**, as will be described in greater detail hereinafter. In addition, as will also be described in greater detail hereinafter, each optically readable disc **40** through **50**, inclusive, has a lamp and photocell arrangement associated therewith, with discs **40** and **42** preferably sharing a common lamp or light source **58**, discs **44** and **46** preferably sharing a common lamp or light source **60** and discs **48** and **50** preferably sharing a common lamp or light source **62**, and with each of the discs **40** through **50**, inclusive, having its own respective conventional photocell, **64** for disc **40**, **66** for disc **42**, **68** for disc **44**, **70** for disc **46**, **72** for disc **48**, and **74** for disc **50**, being associated therewith in optical alignment with the respective light source. Thus, photocell **64** is on one side of disc **40** and is preferably optically aligned with light source **58** located on the opposite side thereof a conventional lens arrangement **76**, photocell **66** is located on one side of disc **42** and is preferably optically aligned with light source **58** located on the opposite side thereof through another conventional lens arrangement **78**, photocell **68** is on one side of disc **44** and is preferably optically aligned with light source **60** located on the opposite side thereof through a conventional lens arrangement **80**, photocell **70** is located on one side of disc **46** and is preferably optically aligned with light source **60** located on the opposite side thereof through another conventional lens arrangement **82**, photocell **72** is located on one side of disc **48** and is preferably optically aligned with light source **62** located on the opposite side thereof through another conventional lens arrangement **84** and photocell **74** is preferably located on one side of disc **50** and is preferably optically aligned with light source **62** located on the opposite side thereof through another conventional lens arrangement **86**. As will be discussed in greater detail hereinafter, the photocells **64** through **74**, inclusive, light sources **58** through **62**, inclusive, and lens arrangement **76** through **86**, inclusive, are all commonly mounted on a movable platform **100** which is preferably bidirectionally movable in the horizontal plane in the example illustrated in FIG. **8** (that is in a direction into and out of the paper) to be indexed to selectively access each of the bands or zones **26, 28, 52** and **54**, in the example given, on each of the discs **40** through **50**, inclusive, in response to index positioning control signals which are provided from the preferred index positioning circuit (illustrated in FIGS. **5, 6A** and **6B** and which will be described in greater detail hereinafter with reference thereto). Input codes, such as from an on line computer or a magnetic tape, are preferably provided to the index positioning circuit to control the operation of a bidirectional rotary solenoid **176** which is preferably geared through a conventional rotary-to-linear gearing network for controlling the bidirectional movement of platform **100** upon which information is optically read from the accessed band or zone in accordance with control of the appropriate selected lamp **58** through **62**, inclusive, and photocell **54** through **74**, inclusive. In addition the preferred right index margin window **37** on disc **40** is optically read by a lamp **63** located in platform **100** support **101** in combination with a photocell **75** optically aligned therewith on the opposite side of disc **40**.

All of the above control circuitry for lamp and photocell control and index positioning is generally indicated in FIG. **8** by the block labeled **106** and will be described in greater detail hereinafter with reference to FIGS. **1, 2, 4, 5, 6A, 6B** and **7**. Suffice it to say that platform **100** is connected to the bidirectional rotary solenoid **176** for linear movement in response to rotation of rotary solenoid **176** through conventional bevel gearing **108–110** and a conventional rack and pinion arrangement **112–114, 116–118**, with bevel gear **110** being mounted on a common shaft **120** with gears **112** and **116**, and with bevel gear **108** being connected to solenoid **176** via shaft **122**. The drive of the disc reading platform **100** in order to accomplish indexing to access the proper zone or band on the appropriate spacing disc **40** through **50**, inclusive, as well as the balance of the associated control circuitry for obtaining the lateral image spacing for drum **22**, will be described in greater detail hereinafter with reference to FIGS. **1,2,4,5,6A,6B** and **7**.

In addition to movement of platform **100** in order to accomplish this indexing, platform assembly **100** as well as the drum mechanism **22** and its drive mechanism, to be described in greater detail hereinafter, are connected in common to another movable platform **124**, such as one similar to the type or platform conventionally provided in the Alphatype **5** p phototypesetting device. In this instance, the entire platform **100** is longitudinally advanced to accomplish line feed for the drum **22**. As will be described in greater detail hereinafter, the presently preferred arrangement will enable bidirectional line feed in the direction of arrows **126** illustrated in FIG. **8**, this bidirectional line feed being accomplished, as will be described in greater detail hereinafter, by use of a bidirectional motor **1302** in cooperation with a carriage advance drive mechanism **128**, which is otherwise conventional except for the manner of accomplishing this line feed under control of a line feed control circuit **1100** and reversible feed control circuit **1300** which will be described in greater detail hereinafter with reference to FIGS. **11** through **15**, and **3** wherein such line feed may be reversible, as well as programmable, and, accordingly preferably controllable in response to an on line computer interface output or magnetic tape output. In accomplishing line feed, platform **124** is advanced by drive mechanism **128** for slidable movement on support shaft **129**.

With respect to lateral spacing control on drum **22**, suffice it to say at this point that the drum **22**, which is selectively positioned for conventional flash exposure of an image at a predetermined relationship to the previous image and which is keyed to common shaft **56**, preferably, together with spacing discs **40** through **50**, inclusive, is conventionally driven by a conventional bidirectional motor **130-slip** clutch **132-brake 134** arrangement in the following manner. As was previously mentioned, the shutter control mechanism for selective image exposure of the photosensitive material carried on drum **22** may be any conventional type, such as utilized in the Alphatype or described in U.S. Pat. No. 2,905,068, by way of example. As will be described in greater detail hereinafter, the drum **22** is linearly movable, in the directions of arrow **126**, to accomplish line advance, and rotatably movable about its longitudinal axis **136** which is coexistent with shaft **56**, to accomplish lateral image spacing of a given line on the drum **22**. Generally, the movement of the drum **22** in order to provide this lateral image spacing in a given line is preferably as follows. Drum **22** is initially commanded to reverse rotation until it senses the starting position (all discs **40** through **50**, inclusive, utilizing a common starting position, preferably). Once this position is set, the drum **22** is then commanded to advance in the designated forward direction responsive to receipt of a brake release pulse to brake **134** from the conventional typesetter control circuit (not shown), such as from a conventional Alphatype phototypesetter. Receipt of this pulse, in turn, deenergizes the brake **134** to enable rotation of the drum by bidirectional motor **130** which is preferably, continuously driven in the forward direction, unless reversed with slip clutch **132** conventionally allowing motor **132** to continue to rotate even when brake **134** is energized, thereby respectively disconnecting drum **22** from motor **130** when brake **134** is energized, in conventional fashion. The brake **134** is selectively deenergized and energized in conventional fashion responsive to the receipt of th encoded digital information from the typesetter, such as, for example, set width identity bits and justification bits which are associated with a given lateral space, four bits normally being utilized to provide set width identity to provide **15** possible combinations for the Alphatype code (preferably providing **4** through **18** units as the lateral spacing, the conventional Alphatype code being a ten bit code wherein six bits are utilized for character and function identity with four bits being utilized for set width identity and two of the function codes being utilized for one and two unit set widths, respectively), and the pulse information supplied from the appropriate photocell **64** through **74**, inclusive, optical reading of the appropriate disc **40** through **50**, inclusive, to start and then stop the drum **22** at the desired lateral spacing. The brake **134** is preferably deenergized upon receipt of this digital information from the typesetter and energized when the pulse information from the appropriate photocell **64** through **74**, inclusive, indicates that the drum **22** has rotated about its axis **136** to a point which corresponds to the desired lateral spacing, such as by coincidence in a conventional counter between the information supplied from the appropriate photocell **64** through **74**, inclusive, and the digital information selected spacing from the typesetter. Of course, suitable conventional means could be employed to have the drum **22** rotate either unidirectionally or bidirectionally in response to this information with bidirectional rotation preferably being provided for in FIG. **8** with the bidirectional motor **130**.

LATERAL SPACING CONTROL

Referring now to FIGS. **1, 2, 5, 6A** and **6B**, the system for providing lateral spacing control for providing the desired lateral image spacing on the drum **22** in a given line thereof shall be described. Initially referring to FIG. **1**, a general overall system block diagram of the preferred lateral spacing control circuitry **106** is shown. Before proceeding further, it should be noted that, as used throughout the specification and claims, the terms zone and band are used interchangeably to refer to the optically readable circumferential bands **26, 28, 52** and **54**, by way of example, on a disc **24** (FIG. **4**). As will be described in greater detail hereinafter, a zone change enable code is provided via path **150** when it is desired to change the zone or band being optically read and/or any one of the selectable discs **40** through **50**, inclusive, on which the band is being read, this zone change enable code being provided via path **150** to a code priming and swinging circuit **152**, to be described in greater detail hereinafter with reference to FIG. **2** and FIGS. **6A** and **6B**, which also preferably receives the clock pulse associated with this zone change enable code via path **154**, the system preferably being a common strobe system.

As will also be described in greater detail hereinafter, receipt of these signals by code priming and swinging circuit **152** activates a relay **156** (FIG. **2**), termed the code swing relay, to latch this relay **156**, as will be described in greater detail hereinafter with reference to FIGS. **2, 6A** and **6B**. In this instance, the next code received via path **150**, with its associated clock pulse received via path **154** after this relay **156** has been latched, will provide the zone selection code which, as will be described in greater detail hereinater, contains an index positioning input code portion provided via path **158** to index positioning circuit **160** and a disc selection input code portion provided via path **152** to a lamp and photocell control circuit **164**. The disc selection code portion of the zone selection code provided via path **162** preferably actually selects which one of the photocells **64** through **74** is to be enabled which, in turn, also preferably selects the appropriate exciter lamp **58** through **62** which is to be energized. In addition, the index positoning portion of the zone selection code provided via path **158** preferably selects, in the example shown, one of four index positions for the lamp-photocell platform **100**, this platform **100** indexing in or out, preferably to be aligned with the appropriate one of the four bands **26, 28, 52** and **54** preferably provided on each of the discs **40** through **50**, these discs **40** through **50**, inclusive, preferably remaining stationary in their axial position although rotatable in common with shaft **56** about this fixed axial position. In addition, as will also be described in greater detail hereinafter, the enable code provided via path **150** is also supplied to a lamp and photocell cut off circuit **170** to turn off or cut off the photocell and lamp that were previously enabled prior to receipt of the present enable code, as will be described in greater detail hereinafter with reference to FIGS. **6A** and **6B**. As will also be described in greater detail hereinafter with reference to FIGS. **6A, 6B** and **7**, at the time of the occurrence of the leading edge of the clock pulse associated with the zone selection code, lamp and photocell selection occurs while at the time of the trailing edge of the clock pulse associated with the zone selection code, the previously latched code swing relay **156** unlatches or unprimes.

The index positioning circuit **160**, which will be described in greater detail hereinafter with reference to FIGS. **5, 6A** and **6B**, preferably continually senses the present position of platform **100** and in response to a zone selection input index positioning code from code priming and swinging circuit **152** provided via path **158**, determines the stepping direction to be provided for platform **100** to reach the selected index position in the optimum time (shortest number of steps). As will be described in greater detail hereinater, this direction signal is provided to a bidirectional stepping and position sensing circuit **172** from index positioning circuit **160** via path **174** to advance the bidirection stepping device **176** (FIG. **5**), which is preferably the previously referred to rotary solenoid **176**, in the appropriate direction, the position sensing porition **178** (FIG. **5**) of the bidirectional stepping and position sensing circuit **172** preferably providing position sensing feedback to index positioning circuit **160** via path **178** which stops the bidirectional stepping device **176** when the selected position is reached. This feedback information provided via path **178** also includes the sensed present position of platform **100** which was referred to above. As will be described in greater detail hereinafter with reference to FIGS. **5**, **6A** and **6B**, the position sensing circuit **178** of bidirectional stepping and position sensing network **172** preferably includes one sensor for providing an indication of the present index position for purposes of enabling determination of an optimum direction for the next position code and a separate sensor for providing an indication of when the selected index position has been reached by platform **100**.

Referring now to FIG. **2**, the lamp and photocell control circuitry **164**, together with the associated code priming and swinging circuitry **152** and lamp and photocell cut off circuitry **170** will be described in greater detail, the entire arrangement being generally referred to by the reference numeral **180**. As was previously mentioned, the zone selection input code disc selection code portion is routed through code swing relay **156** via path **162** to the lamp and photocell control circuitry **164** in the latched position of relay **156**. Preferably, for purposes of explanation, the system shall be described as being operable in conjunction with a conventional Alphatype and all codes referred to, for purposes of explanation, shall be conventional Alphatype codes or variations thereof, unless otherwise specified. Of course, as will be readily understood by one of ordinary skill in the art, any other desired codes could be utilized without departing from the spirit and scope of the invention. In accordance with the above, when relay **156** is latched, the normal code indication of, for example, letters A through F in the conventional ten bit Alphatype code and the set width identity bits of this ten bit conventional Alphatype code, are swung and are utilized to provide zone selection information, as will be described in greater detail hereinafter with reference to FIGS. **6A** and **6B**. The enable code provided via path **150** and its associated clock pulse provided via path **154** are preferably provided to a zone code prime and unprime circuit **182**, to be described in greater detail hereinafter with reference to FIGS. **6A** and **6B**, which circuit forms a portion of the code priming and swinging circuit **152** whose operation was generally previously described above with reference to FIG. **1**. The output of the code swing relay **156**, in the example given, via path **162** is preferably the Alphatype codes for the letters A through F which have been swung by relay **156** in order to provide selection information for photocell **64** through **74**, inclusive, and their appropriate associated exciter lamp **58** through **62**. In addition, as was also previously mentioned, relay **156** also preferably swings the set width identity bits obtained in the conventional ten bit Alphatype code to provide index positioning codes, via path **158**, to index positioning circuit **160**.

For purposes of explanation, paths **162** has been shown as a single path although preferably, in the example given, six parallel paths, one per photocell or disc, are in reality preferably provided. The blocks labeled **184** through **194**, inclusive, in FIG. **2** represents the lamp-photocell control circuitry for each of the discs **40** through **50**, inclusive, respectively, and will be described in greater detail with reference to FIGS. **6A** and **6B**. The respective outputs of the lamp and photocell control circuits **184** through **194**, inclusive, as illustratively shown in FIG. **2**, are respectively provided to the appropriate associated photocell **64** through **74**, control circuit **184** being associated with photocell **64**, control circuit **186** being associated with photocell **66**, control circuit **188** being associated with photocell **68**, control circuit **190** being associated with photocell **70**, control circuit **192** being associated with photocell **72** and control circuit **194** being associated with photocell **74**, with the appropriate control circuit **184** through **194** turning on the selected photocell **64** through **74**, associated therewith. The control signal from the appropriate control circuit **194** through **194** also preferably turns on the proper associated excited lamp **58** through **62**, inclusive, with the exciter lamp **58** being connected in parallel between photocells **64** and **66** to be turned on when either of these photocells is turned on, exciter lamp **60** being connected in parallel between photocell **68** and **70** to be turned on when either of these photocells are turned on and exciter lamp **62** being connected in parallel between photocells **72** and **74** to be turned on when either of these photocells are turned on. As was previously mentioned, the appropriate control circuit **184** through **194** for discs **40** through **50**, inclusive, respectively, is activated in response to th zone selection code provided via the appropriate associated path **162** from relay **156**. As shown and preferred in FIG. **2**, and as will be described in greater detail hereinafter with reference to FIGS. **6A** and **6B**, the lamp and photocell cutoff circuit **170** is connected to the control circuit **184** through **194** to turn off the previously energized lamp and photocell that was previously enabled prior to receipt of the presently received enable code.

Referring now to FIG. **5**, the index positioning circuit **160** and the bidirectional stepping and position sensing network **172** shall be described in greater detail, with reference to FIG. **1** with both positioning circuit **160** and bidirectional stepping and positioning sensing network **172** being collectively gennerally referred to by reference numeral **196**. The index positioning input code provided via path **158** from code swing relay **156** which is, as was previously mentioned, preferably derived from swinging the set width identity bits, is preferably provided in parallel to a band or zone index memory **198**, to be described in greater detail hereinafter with reference to FIGS. **6A** and **6B**, and to a direction circuit **200** which is also to be described in greater detail hereinafter with reference to FIGS. **6A** and **6B**. In the example given, four bands or zones are preferably provided per disc, zones **26**, **28**, **52** and **54**, for each disc **40** through **50**, inclusive, and, accordingly, the memory **198** preferablycomprises 4 conventional flip-flops, one being provided per zone or band in position, with the appropriate flip-flop selected or set, preferably, in response to receipt of the index positioning input code via path **158**. Accordingly, the index positioning input code provided via path **158** preferably sets the proper flip-flop in memory **198**, resets the flip-flop in memory **198** that was previously set and turns on or activates an index drive mechanism **202**, to be described in greater detail hereinafter with reference to FIGS. **6A** and **6B**. Each flip-flop in memory **198** preferably has its own associated two input AND gate in band or zone index gating network **204**, also to be described in greater detail hereinafter with reference to FIGS. **6A** and **6B**, with one input to this two input AND gate being the flip-flop set output and the other input being provided via path **206** from sensing network **178.** For purposes of explanation, only single paths are shown between memory **198** and gating network **204** and between sensing portion **178** and gating network **204**, these paths actually being parallel paths with one being provided per gate, preferably. As was previously mentioned, band or zone sensing network **178** preferably comprises two sensing portions, one portion providing a signal via path **206** to gating network **204** when the selected position is reached by platform **100**, and the other portion providing a present position sensed signal via path **208** to direction circuit **200.** As will be described in greater detail hereinafter, when the appropriate AND gate in gating network **204** receives an input from the appropriate flip-flop of memory **198**, and another input via path **206** from sensing network **178**, so that both of these inputs are present in the appropriate gate, an output signal is provided to index drive **202** via path **210** which turns off the index drive mechanism **202**. The direction circuit **200**, as will be described in greater detail hereinafter, which also receives the index positioning input code via path **158** and the present position sensing information via path **208**, preferably operates in response to the index positioning input code information via path **158** dependent on the information provided via path **208** from sensing network **178** to provide an output signal to index drive **202** via path **212** which, in turn, provides directional pulses, labeled IN via path **214** or OUT via path **216**, to bidirectional stepping device **176** to step platform **100** in towards the center of the discs or out away from the center of the discs and towards the peripery. For purposes of explanation, path **208** has been shown as a single line although preferably actually four parallel paths are provided to direction circuit **200** in which the present position path **208** is enabled to provide the present position information to direction circuit **200** for use in determining the optimum direction.

Referring now to FIGS. **6A** and **6B**, when taken together provide a schematic of the lateral spacing control circuitry generally described above with reference to FIGS. **1**, **2** and **5**, the structure and operation of the lateral spacing control circuitry **106** (FIG. **8**) shall be described in greater detail. As was previously mentioned, the input codes which control the operation of the lateral spacing control circuitry are preferably provided by swinging conventional Alphatype codes, although as previously mentioned any other codes could be utilized, by operation of the code swing relay **156** to provide the index positioning input code for zones or bands **1** through **4**, in the example given, via path **158** by swinging the set width identity bits of the conventional Alphatype code and to provide the disc selection input codes via path **162** by way of example, by swinging the conventional A through F Alphatype codes. As shown in FIGS. **6A** and **6B**, conventional relay notation is utilized in indicating the normally closed and normally open position of the various relays employed including code swing relay **156.** As shown in FIG. **6B**, in the preferred example of the present invention wherein the Alphatype codes for A through F are swung to provide the disc selection codes via path **162** and the set width identity bits of the Alphatype code normally labeled **−8**, **−4**, **−2** and **−1** are swung to provide the index positioning codes for zones **1** through **4**, in the example given, via path **158**, relay **156** is shown withcontacts **156***a*, **156***b*, **156***c*, **156***d*, **156***e*, **156***f*, **156***h*, **156***j*, **156***k*, **156***m*, in the normally closed unlatched position of the relay **156** wherein the conventional Alphatype codes for the letters A through F and the set width identity bits **−8**, **−4**, **−2** and **−1**, would normally be provided. In order to latch the code swing relay **156**, the clock pulse associated with the zone change enable code is preferably provided via path **154** to a transistor **252** which is driven to saturation for the duration of the clock pulse provided via path **154.** A capacitor **254** which is preferably connected to the collector of transistor **252**, with transistor **252** saturated, or conducting, preferably discharges through transistor **252** to ground. At the completion of the clock pulse provided via path **154**, transistor **252** preferably cuts off and capacitor **254** again charges to a predetermined potential value which, in the example shown in FIG. **6B**, is plus **20** volts. In this preferred arrangement, when capacitor **254** charges, a diode **256** connected thereto sees a positive going pulse. When a zone change enable code signal is provided via path **150**, this signal is passed through a conventional mixer control switch **258** to the base of a transistor **260** (through a resistor **262**) which is driven into saturation. Capacitor **254**, which is previously described, will preferably only charge when point **264** is not at ground potential. Accordingly, when transistor **260** is saturated due to the signal provided via path **150** through switch **258**, this point **264** will be at ground potential so that capacitor **254** will not charge and will not pass a positive spike through diode **256.**

A ground potential is also placed at point **270** in the zone code and unprime circuit **182** when transistor **260** is saturated, with the duration of the saturation of transistor **260** being determined by the width of the zone change enable code pulse present on path **150**, this pulse width preferably being identical with that of the associated clock pulse provided via path **154** The ground potential present at point **270** for the duration of the zone change enable code pulse, in turn causes transistor **272** of a conventional flip-flop network **274** to conduct which in turn causes the other transistor **276** of the flip-flop **274** to cut off in conventional fashion. This in turn allows a transistor **278** connected to the output of the flip-flop network **274** to saturate through a conventional voltage divider biasing network connected between the base of transistor **278** and the output of the flip-flop network **274.** Preferably, the values of the voltage divider biasing network **280** are chosen so as to forward bias transistor **278** when there is no external voltage provided from transistor stage **276** of the flip-flop **274.** When transistor **278** saturates due to the forward bias potential applied through the voltage divider network **280**, relay **156** latches due to the current supplied through relay coil **282**, which as shown and preferred, has a diode **284** connected thereacross to provide conventional counter EMF protection. In the latched position of relay **156**, the normally closed contacts illustrated in FIG. **6B** are open and the normally open contacts illustrated in FIGS. **6B** are closed so that paths **162***a* through **162***f* and **158***a* through **158***d* are closed. In this manner, when the letter codes A through F or the set width identity bits **−8**, **−4**, **−2**, or **−1**, are provided from the Alphatype, these codes will be swung by relay **156** and provided via path **162***a* through **162***f* for letter codes A through F and **158***a* through **158***d* for the set width identity bit codes in the later position of code swing relay **156.**

Before describing how the zone change enable code received via path **150** cuts off the previously enabled photocell-lamp arrangement, the selection of the proper disc **40** through **50**, inclusive, to be optically read to provide the lateral spacing control information shall be described. As was previously mentioned above, since relay **156** is now latched, the disc selection code to be provided via path **162** will be one of the letters A through F of the Alphatype code which, because they are now swung by the latched relay **156**, will in turn be one of the disc selection codes D1 through D6, respectively, provided via paths **162***a* through **162***f*, respectively. For example, if the particular disc to be selected for a particular lateral space is disc **40** which, in the example given, is associated with disc selection code D1 provided via path **162***a*, this signal will be provided to disc control circuit **184** via path **162***a* through diode **290** and resistor **292** at the input of control circuit **184** to the gate of a conventional SCR **294** causing the SCR to conduct. When SCR **294** conducts, a path is provided for the current flow from path **296**, to be described in greater detail hereinafter, through a relay coil **298** and a relay coil **300** connected in parallel therewith through a diode **302** connected between coils **298** and **300** and then through SCR **294**, which is now conducting, through path **304** to ground thereby latching relay coils **298** and **300** to close normally open contacts **298***a* and **300***a*, respectively. Thus, the latching of relay **298** which closes normally open contact **298***a*, as shown and preferred, connects photocell **64** in the circuit to provide the output thereof to the conventional Alphatype counting circuitry to be described in greater detail hereinafter with reference to FIG. **10**, by connecting the anode of photocell **64** to the common photocell output line **306**. Similarly, the latching of relay **300** which closes normally open contact **300***a*, turns on exciter lamp **58** by placing the lamp voltage, such as 3.4 volts in the example shown in FIG. **6B**, across the exciter lamp **58.** Accordingly, as previously mentioned, the photocell and its associated lamp are preferably turned on simultaneously. Preferably, the operation of the balance of the disc selection control circuits **186** through **194**, inclusive, is identical with that previously described with reference to disc control circuit **184** with the exception that each of these circuits **186** through **194** is responsive to a different disc selection code provided on the appropriate one of the paths **162***b* through **162***f*, respectively, corresponding to letter codes B through F being swung by the code swing relay **156**, these disc selection codes being respectively indicated by the notations D2 through D6, respectively, for disc control circuits **186** through **194**, respectively. For example, if either path **162***a* or **162***b* provides a disc selection code signal D1 or D2, respectively, to the associated disc control selection circuit **184** or **186**, respectively, the appropriate conducting SCR, SCR **294** in the instance of control circuit **184** and SCR **308** in the instance of control circuit **186**, will provide a path through the common coil **300** (with this path with respect to energizing light source **58** and photocell **64** having been previously described with respect to coil **298** and coil **300** for control circuit **184**) and, for control circuit **186**, with respect to the disc selection code being provided via path **162***b*, coil **310** being latched for providing a path to ground through conducting SCR **308** and coil **300** through diode **312** connected between coils **300** and **310** through SCR **308** to ground. The latching of coil **310** preferably closes normally open contact **310***a* which will place photocell **66** in the circuit to provide an output via path **306** and will, preferably, simultaneously, through the latching of coil **300** turn on exciter lamp **58** which, as shown and preferred in FIG. **8**, is shared by photocell **64** and **66** through lenses **76** and **78**, respectively, to illuminate either disc **40** or disc **42.** As was previously mentioned, similar sharing of light source **60** by photocells **68** and **70** and of light source **62** by photocells **72** and **74** is provided through the use of a common relay coil circuit arrangement identical with that previously described with reference to control circuits **184** and **186.** Accordingly, these control circuits **188** and **190**, and **192** and **194**, respectively, will not be described in greater detail hereinafter.

As was previously mentioned, receipt of the zone change enable code via path **150** cuts off the previously enabled photocell-lamp combination to precondition the disc control selection circuits **184** through **194** and the photocells **64** through **74** and lamps **58** through **62**, to be ready to respond to receipt of the appropriate disc selection code provided via paths **162***a* through **162***f* after the code swing relay **156** has been latched in the manner described above in response to receipt of a zone change enable code and its associated clock pulse. This cutting off is accomplished by the lamp and photocell cut off circuit **170** in the following fashion. The zone change enable code pulse signal provided via path **150**, which is provided to transistor **260** through switch **258**, is also provided in parallel through a resistor **312** and a diode **314** connected to the base of a transistor **316** of the lamp and photocell cut off circuit **170.** This signal causes transistor **316** to preferably be reverse biased for the width of the zone change enable code pulse signal provided via path **150** which cuts off transistor **316** for this interval. The cutting off of transistor **316** preferably removes a positive potential which has been present on path **296** which is connected to the collector of transistor **316** thereby unlatching whichever relay coils in the disc control circuits **184** through **194** had previously been energized and, accordingly, returning the closed contacts to their normally open position thereby disconnecting the associated previously energized light source **58** through **62** from its power source and previously energized photocell **64** through **74** from the circuit.

If desired, the operation of code swing relay **156** may be superseded and manually controlled by closing normally open switch contact **258***a* of mixer control switch **258** thus opening normally closed contact **258***b* ganged thereto. In this manner, the unlatch pulse received via path **259** which is produced from the changing of, by way of example, 1 of 10 type font faces, will turn off the previously excited SCR-photo cell-lamp combination, in the manner previously described above, by interrupting current flow in path **296**, without latching relay **156** as this latching path is now open due to the opening of contact **258***b*. In this condition, the zone change enable code will preferably be followed by receipt of a manually provided disc selection code via one of paths **350***a* through **350***f* to provide one of the selection codes D1 through D6, preferably from, in this mannual operation, a **24** position manual rotary switch, to be described in greater detail hereinafter with reference to FIG. **15**, having positions corresponding to each of the **10** type font faces, in the above example.

Referring now primarily to FIG. **6A** as well as to FIG. **6B**, the index positioning circuitry **160** and bidirectional stepping and sensing network **172**, both generally referred to by the reference numeral **196** in FIGS. **1** and **5**, shall now be described in greater detail. Referring initially to FIG. **6B**, band or zone sensing network **178** preferably comprises a switch preferably mounted on the bidirectional rotary solenoid **176** to sense both the present position of the platform **100** as well as to sense when a preselected position has been reached. As shown and preferred, by way of example, this switch is preferably a six pole, three throw eighteen position switch comprising two portions designated **178***a* and **178***b* which are utilized with portion **178***a* providing information corresponding to the present position of the platform **100** via paths **208***a* through **208***d*, labeled **1**' sense, **2**' sense, **3**' sense, and **4**' sense, respectively, to direction circuit **200**, and with portion **178***b* providing a signal indicative of the preselected desired position via paths **206***a* through **206***d* to gating network **204**, the path being labeled respectively **1**° sense, **2**° sense, **3**° sense and **4**° sense. Portion **178***a* which provides an indication of the present position of the platform **100** and, hence, the present position of the lamp-photocell arrangement with respect to the band or zone capable of being sensed thereby, to direction circuit **200** via paths **208***a* through **208***d*, as shown and preferred will have a positive potential, such as 20 volts, on the contact of the switch corresponding to the present position **1**' sense through **4**' sense so as to complete a circuit path from this source of positive potential to the appropriate path **208***a* through **208***d*. In the example shown in FIG. *6b*, the platform **100** is at the innermost band (band **54** in FIG. **4**) as indicated by the connection between the source of positive potential and path **208***d*. In the example given, path **208***a* corresponds to band **26** of FIG. **4**, path **208***b* corresponds to band **28** of FIG. **4**, path **208***c* corresponds to band **52** of FIG. **4**, and, as previously mentioned, path **208***d* corresponds to band **54** of FIG. **4**. Thus, this positive potential is supplied to the appropriate sensing mechanism in direction circuit **200**, as will be described in greater detail hereinafter. As previously mentioned, since it is preferred to optimize the movement of the platform **100** to obtain the appropriate selected band on the appropriate disc to be optically read, whenever the present position of the platform **100** is indicated as being the innermost band, which is the **4**' sense position indicated by path **208***d*, than the platform **100** should preferably be moved out to reach any of the other bands to be subsequently optically read; whereas if the present position of the platform **100** is at the outermost band, indicated by the **1**' sense position, corresponding to path **208***a*, then platform **100** should preferably be moved in to reach any of the subsequent bands or zone on the disc to be optically read. Similarly, if the present position of the platform **100** is indicated as being at band **52** which corresponds to the **3**' sense position for path **208***c* and the next band to be sensed or optically read is band **26** corresponding to path **208***a*, then platform **100** would have to preferably be moved in the outward direction. Thus, as will be described in greater detail hereinafter, the present position of the platform **100** as indicated by switch portion **178***a* preferably determines which direction, IN or OUT, the direction circuit **200** will move or drive the platform **100**.

As was previously mentioned, all of the photocells **64** through **74** and lamps **58** through **62** and their associated lenses **76** through **86** are mounted in common on platform **100** so as to be simultaneously moved therewith with each of the photocells and associated lens and light sources all preferably being optically aligned along the same optical axis so that they each access the same corresponding band on the respective discs **40** through **50** at a given index location of the platform **100**. Thus, for example, if the platform **100** is located so that photocell **64** and light source **58** and the corresponding lens **76** are aligned with the outermost band **26** of the disc **40** so as to optically read this band, each of the photocell and lamp arrangements is simultaneously optically aligned with the outermost band **26** of the corresponding disc **42** through **50** associated therewith. Similarly, if the platform **100** is indexed so as to align the photocell-lens-lamp arrangement **64-76-58** associated with disc **40** with band **52**, by way of example, of the associated disc **40**, then each of the photocell-lamp-lens arrangements will correspondingly be aligned with band **52** of their respective associated discs **42** through **50**. Thus, it is to be understood that when the specification and claims talk about indexing or movement of platform **100** it is in effect talking of aligning the corresponding photocell-lens-lamp arrangements with the respective band on the associated disc to be read.

Referring now to FIG. **6A**, for example, if the present position of the platform **100** is such that the photocell-lens-lamp arrangements are optically aligned with the innermost band **54** of the discs **40** through **50**, indicated by the **4**' sense position with this potential being provided via path **208***d*, the positive potential is supplied via path **208***d* to the base of a transistor **400** of flip-flop network **402**, causing transistor **400** to be cut off which, in flip-flop network **402**, correspondingly allows another transistor **404** to be saturated or turned on as in any conventional flip-flop. When transistor **404** is saturated, the potential present at its collector causes transistor **406** whose base is connected thereto to be cut off. As shown and preferred, this condition of flip-flop **402** also allows another transistor **410** to be able to go into saturation while its emitter is positive, transistors **406** and **410** preferably representing two AND gates having a common input at a junction point **412** where there emitters are coupled. When the index drive **202** is activated, it preferably will supply a predetermined pulse train going from ground to predetermined positive potential value to point **412**. Since, as described above in the example given, the base of transistor **410** was low, transistor **410** will conduct allowing the pulse train present at point **412**, which will be provided in the manner to be described in greater detail hereinafter, to pass through transistor **410**, through a resistor **414** connected to the collector output of transistor **410**, to the base of another transistor **416**. Whenever the pulse train applied to the base of transistor **416** is positive, transistor **416** saturates thereby placing a ground potential at point **418** for the duration of the on time of the positive pulse. As shown and preferred, the index drive circuit **202** preferably includes a pair of Darlington power amplifiers **420** and **422**, such as a conventional LMD **5** Darlington power amplifier manufactured by Ledex Inc. These Darlington current amplifiers **420** and **422** are connected, respectively, to the IN winding **424** and OUT winding **426** of the bidirectional rotary solenoid stepping device **176**. When point **418** is at ground potential, this preferably causes a ground potential to be present at point **428** thereby allowing the positive potential supplied thereto to conduct through the OUT winding **426**, through Darlington current amplifier **422** to ground causing a rotary motion of, preferably, **20** degrees per step in the OUT direction of rotary solenoid

176 which is used to index platform 100 in predetermined linear steps, such as ¼ inch steps depending on the desired band spacing of the disc, to the desired band, the rotary-to-linear conversion being accomplished in conventional fashion as previously described with reference to FIG. 8 with respect to the bevel gearing and rack-and-pinion arrangement for moving platform 100. This movement will continue until the desired band is reached, as will be described in greater detail hereinafter, the above discussion being primarily directed to the operation of the direction circuit 200.

If for example, the present position of the platform 100 is with the lamp-photocell-lens arrangements aligned with the outermost band 26 of the discs 40 through 50, inclusive, which is indicated as the 1' sense position associated with path 208*a*, transistor 404 of flip-flop 402 will be cut off, causing transistor 400 to be saturated, as in any conventional flip-flop, due to the positive potential being provided via path 208*a* to the base of transistor 404. Since transistor 400 is cut off, this will allow transistor 406 to conduct when a pulse train from index drive circuit 202, supplied from a conventional multivibrator 440 to be described in greater detail hereinafter, is present at point 412. Transistor 406 will pass this pulse train through resistor 442 connected to the collector output thereof to the base of another transistor 444 of index drive circuit 202 which, as was previously described with reference to transistor 416, will preferably saturate during the intervals when this pulse train present at point 412 is positive. When transistor 444 saturates, this will preferably cause point 446 to go to ground potential which, in turn, will cause a ground potential to be present at point 450 thereby allowing the positive potential supplied thereto to conduct through the IN winding 424, through the current amplifier 420, to ground causing a rotary motion, preferably, of 20° per step in the IN direction of rotary solenoid 176 to index platform 100 in predetermined linear steps until the desired band or zone is reached, as will be described in greater detail hereinafter. A conventional power supply for the rotary solenoid 176 is indicated by reference numeral 452 in FIG. 6A which includes the power supply for the Darlington current amplifiers 420 and 422 as well as the Power supply for the motor or rotary solenoid 176, and will not be described in greater detail hereinafter since it is preferably conventional.

Now considering, by way of example, when the platform 100 is at a present position corresponding to the alignment of the photocell-lamp-lens arrangements with band 28, indicated as the 2' sense position corresponding to band 208*b*, a predetermined positive potential is supplied to the base of a transistor 460 via path 208*b*, with transistor 460 forming one transistor of a flip-flop transistor pair 462, with the other transistor being transistor 464. This positive potential at the base of transistor 460 causes transistor 460 to saturate thereby making transistor 464 cut off in conventional flip-flop fashion. Because of the condition of transistors 460 and 464, point 466 is at a positive potential whereby point 468 is at ground potential. In this condition, if a positive input appears via path 158 as an input code from path 158*a*, corresponding to a Z1 code, this signal will preferably pass through resistor 470 connected to this input lead, then through a diode 472 connected in parallel thereto, through path 474 and 208*d* to the base of transistor 400 causing transistor 400 to cut off and, in turn, thereby causing transistor 404 to conduct, with the signal being subsequently processed for this condition as previously discussed above with respect to this condition of flip-flop 402 causing OUT coil 426 to be energized. If instead, with the platform 100 in this position, a positive input were received at path 158*c* corresponding to index position code Z3, it would pass through a resistor 476 connected in parallel to this input path, then through diode 478 connected in parallel thereto, thereby placing a positive potential at the base of transistor 404 via path 480 and 208*a* causing transistor 404 to cut off, which, in turn, thereby causes transistor 400 to saturate and the signal is subsequently processed as previously described above for this condition of flip-flop 402 causes IN coil 424 to be energized. Similarly, if instead a positive input were received on path 158*d* assigned to the presence of a Z4 next positioning input code, the signal would pass through resistor 482 connected in parallel to this input lead, then through diode 484 connected in parallel therethrough, through paths 480 and 208*a* with the base of transistor 404 causing it to cut off which, in turn, causes transistor 400 to saturate. The signal is processed as described above for this condition of flip-flop 402 causing IN coil 424 to be energized.

Lastly, considering, by way of example, the condition when the present position of the platform 100 is with the photocell-lamplens arrangement optically aligned with band 52, indicated by the 3' sense position corresponding to path 208*c* in FIG. 6*b*, a predetermined positive potential preferably present at the base of transistor 464 provided via path 208*c*, such as a 20 volt potential illustrated by way of example in FIG. 6B, causes transistor 464 to saturate which, in turn, causes transistor 460 of flip-flop 462 to cut off. Because of this condition of flip-flop 462, point 468 is at a positive potential whereby point 466 is at ground potential. In this condition, if a positive input appears on path 158*a*, it will pass through resistor 490 connected in parallel to path 158*a*, through diode 492, through path 474 and 208*d* to the base of transistor 400 causing transistor 400 to cut off which, in turn, causes transistor 404 to saturate, and the signal is processed as previously described above with respect to this condition of flip-flop 402 causing OUT coil 426 to be energized. If instead, a positive input were received via path 158*b*, corresponding to the Z2 index positioning input code, this signal would pass through resistor 498 connected in parallel to input path 158*b*, then through diode 500, and through paths 474 and 208*d* to the base of transistor 400 causing transistor 400 to cut off and transistor 404 to saturating creating the same condition as mentioned above with respect to the presence of a positive potential on path 158*a*, thereby causing OUT coil 126 to be energized. On the other hand, if a positive input were received at path 158*d* corresponding to the input indexing code Z4, this signal would be passed through resistor 502 connected in parallel to this input path, then through diode 504 and through paths 480 and 208*a* to the base of transistor 404 causing transistor 404 to cut off which, in turn, causes transistor 400 to saturate with the signal being processed as previously described above with respect to this condition of flip-flop 402 causing the IN coil 424 to be energized.

Now that the structure and operation of the direction circuit 200 in conjunction with the index drive circuit 202 has been described, the structure and operation of the band index memory 198 and gating circuit 204 in conjunction with the index drive 202 shall be described. As also shown and preferred in FIG. 6A, the zone or band selection code input signals provided via paths 158*a* through 158*d* are each preferably connected in parallel to respective conventional flip-flops **510, 512, 514,** and **516,** respectively, which preferably comprise the band index memory **198.** These flip-flops are conventional and will not be described in greater detail hereinafter; however, for purposes of explanation of the system of the present invention, the appropriate portions shall be described where applicable. When a positive signal is present on any one of the zone selection code input paths **158***a* through **158***d*, this signal sets the associated flip-flop **510** through **516**, respectively. For example, if a positive potential were present on path **158***a*, this signal would preferably flow through diode **518** connected thereto and resistor **520** connected in series therewith, to point **522.** This positive potential at point **522** preferably accomplishes placing a positive potential at the collector of transistor **524** comprising one of the two transistors of the flip-flop network **510** which causes transistor **526** which is the other transistor of flip-flop network **510** to cut off which, in turn, causes transistor **524** to be saturated in conventional fashion. This is preferably the set position of flip-flop **510.** In addition, the positive potential present at point **522** preferably causes a capacitor **528** connected thereto to charge and discharge through a diode **530** connected in series therewith and voltage divider network **532** to ground, thereby causing transistor **534** whose base is connected to network **532** to be cut off. This removes the $+V_1$ potential from a point **536** to which the base of transistor **526** is connected in parallel, thereby resetting all other flip-flops, **512** through **516** in the example given, by removing the positive potential V_1 from the voltage divider biasing networks for the respective transistors. When transistor **534** is cut off, this also provides a reset signal to a flip-flop **540** contained in the index drive circuit **202,** to be described in greater detail hereinafter, by removing the bias potential from one transistor **542,** via path **544,** of the transistor pair **542–546** comprising flip-flop **540,** which is preferably a conventional flip-flop. A positive potential present at point **522** preferably provides one input to a conventional two input AND gate **550** of band index gating network **20,** with gate **550** preferably comprising transistor **552** and diode **554** connected to the collector thereof, with point **522** being connected to the emitter of transistor **552** via path **548.** This makes the emitter of transistor **552** positive. The other input to AND gate, **550** is provided via path **206***a* to the base of transistor **552,** as will be described in greater detail hereinafter, when the 1° sense position for outermost band **126,** is sensed or reached by platform **100.**

Preferably, as a result of the resetting of flip-flop **540** of index drive **202,** transistor **542** saturates which, in turn, causes transistor **546** to be cut off. Because transistor **542** is saturated, diode **560,** termed the tape clamping diode, which is preferably connected to a tape clamp point normally contained on board **28** of the conventional Alphatype model 5p, conducts causing the processing of further signal input to the typesetting machine (now shown) to be halted until the functions that are now being processed by the system of the present invention are completed. Because transistor **546** is cut off, the clamp voltage is removed from the freerunning multivibrator **440** via diode **562.** Similarly, when diode **562** conducts, then free-running multivibrator **440** is turned off. Preferably, during the operation of free-running multivibrator **440,** point **564** receives the previously described pulse train provided from multivibrator **440** which, is, in turn, supplied via path **566** to point **412** and passed through either transistor **406** or **410,** as previously described, causing either the step-IN coil **424** or the step-OUT coil **426** to be energized.

For example, in the example given above with respect to a positive signal being present on path **158***a* providing a positive potential via path **548** to the emitter of transistor **522** of AND gate **550,** the OUT coil **426** will be energized causing, preferably, by way of example, 20° steps of the rotary solenoid stepping device **176,** this 20° rotation being conventionally translated, as previously mentioned, into predetermined linear incremental movement. The platform **100** will preferably step until the sensing mechanism **178***b* senses the presence of a predetermined impedance **570,** such as a 47,000 ohm resistor, by way of example, at the preselected 1° sence position corresponding to path **206***a* and corresponding to the desired band **26,** in the example given. This in turn provides an input to the base for transistor **552** via path **206***a* causing transistor **552** to saturate thereby putting a positive potential on line **572** through diode **554.** This positive potential on line or path **572** preferably causes a capacitor **574** connected in series therewith which is, in turn, connected to the base of transistor **542,** to charge and discharge to provide a positive spike at the base of transistor **542** causing it to cut off which, in turn, thereby causes transistor **546** to saturate. Preferably, when transistor **542** is cut off, the further processing of input signals is enabled. Since transistor **546** is now saturated and transistor **542** is now cut off, diode **562** conducts and free-running multivibrator **440** is turned off, thereby stopping the stepping operation. The balance of the circuitry in FIGS. **6A** and **6B** is conventional and will be readily understood by one of ordinary skill in the art and will not be described in greater detail hereinafter. Suffice it to say that, as was previously described with reference to FIG. **6B,** if desired, manual control of disc selection may be provided through a rotary switch control network, which will be described in greater detail hereinafter with reference to FIG. **11,** which, in addition to providing the disc selection codes via paths **350***a* through **350***f* (FIG. **6B**) also preferably provides the zone or band selection codes via paths **580***a* through **580***d* for bands **26, 28, 52** and **54,** respectively. In addition, it should be understood that preferably the structure and operation of flip-flop stages **512** through **516** of memory **198** and AND gating stages **551, 553,** correspondingly respectively to the 2° sense, 3° sense and 4° sense positions of sensing device **178***b*, of gating network **204** are preferably identical with that previously described above with respect to flip-flop **510** and AND gate **550,** by way of example.

Referring now to FIG. **7,** a timing diagram illustrative of the timing of the various signals present in the preferred lateral spacing control circuitry previously described with reference to FIGS. **6A** and **6B** is shown by way of example. Graph A of FIG. **7** illustrates the disc or zone change enable code associated clock pulse provided via path **154,** illustratively shown as pulse **800** with the disc selection code associated clock pulse, which is illustrated by pulse **802** occuring a predetermined delay time after the occurrence of the zone change enable code clock pulse **800,** such as approximately 100 miliseconds thereafter. As graphically illustrated in graph B of FIG. **7,** the zone prime latch signal **803** occurs between the leading edge of the zone change enable code pulse **800** and the trailing edge of the disc selection code clock pulse **802** at transistor **278** of FIG. **6B.** Preferably, the zone prime latching occurs at point

804 in the signal of graph B and the unlatching of relay 156 occurs at point 806 in the signal illustrated in graph B of FIG. 7. Graph C of FIG. 7 illustrates the photocell and lamp cut off signal present on path 296 of FIG. 6B. Graph D of FIG. 7 illustrates the actual zone change enable code pulse signal present on path 150 as opposed to the associated clock pulse 800 which is utilized to cause the occurrence of the zone prime latch signal 803 of graph B and the photocell-lamp cut off signal 808 of graph C, this signal being indicated by reference numeral 810. Graph E of FIG. 7 illustrates, by way of example, actual codes that are swung by relay 156, with graph E illustrating a typical indexing code which is swung from the Alphatype set width identity bits to accomplish platform indexing and illustrates the associated clock pulse 812 thereof. Graph F illustrates a typical disc selection input code which is swung from the Alphatype codes for the letters A through F for photocell and lamp selection, as indicates by the reference numeral 814 and which may include the SS bit enabling the half disc mode. Graph G of FIG. 7 preferably illustrates the clamping function provided by diode clamp 560, and, as illustrated in FIG. 7, graph G of pulse 815, at the leading edge of the platform indexing pulse 812 indicated by point 816, flip-flop 540 is set, clamping any further input signals from entering and placing the Alphatype, if that is the device utilized with the present invention, in the halt condition until the indexed platform 100 has reached its preselected appropriate position, after which the further processing of codes is enabled as indicated at point 818, by way of example. Normally, as indicated by graph H of FIG. 7, which illustratively shows the stepping pulse 820, 822 and 824 shown by way of example, which cause the rotation of the rotary solenoid 176 and, hence, the linear incremental movement of the platform 100, when the platform 100 is in its final position, that is the predetermined position, and this position is sensed as previously described with reference to switch portion 178*b*, pulse 824, by way of example, being the last stepping pulse required to place the platform 100 in this position. Graph I of FIG. 7 represents the pulse 825 on line 572 (FIG. 6A) when the desired position is sensensed. This pulse 825 causes flip-flop 540 to change state, removing positive potential from diode 560 causing clamping signal 815 represented by graph G to go to zero as indicated at point 818. It should be noted that the zone change enable code, as previously mentioned, could be provided either from a computer from a magnetic tape or internally from a generator when one of the ten type font faces, by way of example, is changed and requires a different disc.

Referring now to FIG. 16, as was previously mentioned, the lateral spacing control provided from selection of the appropriate disc to be read can preferably be provided either in the full disc mode or the half disc mode dependent on the condition of the conventional half disc mode sensing circuitry (not shown) associated with the conventional Alphatype, by way of example, which control is the processing of the information being provided from the selected disc to process this information in the half disc mode in conventional fashion when the conventional half disc mode sensing circuitry is enabled and in the full disc mode when this sensing circuitry is not enabled. As was previously mentioned, the disc selection input code, such as graphically illustrated by Graph F of FIG. 7 may include the SS bit whose presence, when sensed by disc mode control network 4990, will automatically enable the half disc mode sensing circuitry of the conventional Alphatype, as will be described with reference to FIG. 16. The preferred disc mode control network 4990 is preferably connected to the collector of transistor 272 of flip-flop 274 (FIG. 6B), previously described with reference to the zone code prime and unprine network 182 shown in FIG. 6B, via path 5000, through a diode 5002 connected through a resistor 5004 to the base of a transistor 5006. The collector of transistor 5006 is preferably connected to a junction point 5008 which is at ground potential when transistor 5006 is saturated. When transistor 5006 is unsaturated, junction point 5008 is preferably no longer at ground potential and the condition of the "SS bit" flip-flop in the conventinal Alphatype serial-to-parallel convertor, whose outputs on Bd 28k are at points 5010 and 5012 which are, respectively, SS° and SS′. When flip-flop 274 (FIG. 6B) is set, transistor 5006 comes out of saturation, which, as previously mentioned, enables the sensing of the condition of the SS bit flip-flop. If the SS bit is present, in other words the SS bit flip-flop is set, the SS′ output line at point 5012 will be high and the SS° output line at point 5010 will be at ground potential. Therfore, the associated clock pulse that is provided to point 5014 from Bd 28k will pass through resistor 5016, transistor 5018 of flip-flop 5020 will cut off and transistor 5022 will saturate passing a positive potential through diode 5024, which potential is provided to the conventinal half disc sense circuit of the conventional Alphatype (specifically to the SW terminal on BD 28k) to place the Alphatype in the half disc mode, the Alphatype remaining on the half disc mode until the next zone change enable code is processed in the manner described above, in which case flip-flop 274 will again be set. If the SS bit, on the other hand, is not present, in other words the SS bit flip-flop is not set, the SS° output line at point 5010 will be high and the SS′ output line at point 5012 will be at ground potential. Therefore, the associated clock pulse that is provided to point 5014 will pass through resistor 5030 causing transistor 5022 to cut off and, accordingly transistor 5018 to saturate, thus preventing conduction through diode 5024 and the half disc sense circuit of the conventional Alphatype will not be enabled, the Alphatype, accordingly, being in the full disc mode.

"Alternative embodiment-manual control of disc selection"

Referring now to FIG. 11, a preferred embodiment of a rotary switch control network, generally referred to by the reference numeral 850, for providing manual control of lateral spacing, or disc selection is shown, the rotary switch control network 850 providing the disc selection signals via path 350*a* through 350*f*, as previously mentioned in the discussion of FIG. 6B, and the zone or band selection signals via path 580*a* through 580*d*, as previously mentioned in the discussion of FIG. 6A. Preferably, as will be described in greater detail hereinafter, the preferred rotary switch control netork 850 harnesses the code information provided from a conventional phototypesetting system, such as an Alphatype, to modify these signals so as to render them acceptable to the automatic lateral spacing control circuitry previously described with reference to FIGS. 6A and 6B. For purposes of explanation, the rotary switch control network 850 shall be described as being utilized with a conventional Alphatype which is the presently preferred utilization of the system previously described with reference to FIGS. 6A and 6B although, it would be readily understood to one of ordinary skill in the art, that any other type of code providing system could be utilized to accomplish lateral spacing control in accordance with the present invention.

As is well known, each font conventionally normally has two faces which are conventionally identified by the terms "red register" and "black register" in a conventinal Alphatype. The conventional Alphatype mixer, represented in FIG. **11** by block **852**, such as for the Alphatype model **5p**, conventionally provides pulse codes directing a specific type font change via path **854***a* which also receives the conventional Alphatype red and black register codes on paths **854***b* and **854***c*, respectively.

In general referring to the rotary switch conrol network **850** in FIG. **11**, this arrangement preferably comprises the conventinal 10 rotary switches for the Alphatype, one of which is typically shown by reference numeral **856**, each of which is preferably a **24** zone rotary switch capable of providing two output pulses, one corresponding to the zone or band to be selected provided via path **580***a* through **580***d* to the index positioning circuitry of FIGS. **6A** and **6B**, and the other output being the disc selection signal provided via any one of paths **350***a* through **350***f* to the disc selection control circuitry of FIGS. **6A** and **6B**. By way of example, rotary switch **856** is shown in the position for selecting the outermost band, band **26** or zone **1**, on disc **1**, or disc **40** in the example given. Of the ten rotary switches, there are five conventionally provided for the red register zone and five conventionally provided for the black register zone with a red register zone switch and a black register zone switch being provied for each type font, one for each face. By way of example, the Alphatype conventionally has five type fonts, normally labeled A through E in FIG. **11**, although any other number of type fonts could be utilized with the system of the present invention. Thus, in the example shown, as previously mentioned, the five type fonts A through E provide ten faces, with each type font having two faces, one face being determined by the red register switch and the other face being determined by the black register switch. Furthermore, for purposes of explanation, the red register switch is conventionally comprises a three position swtich and a 24 positon switch for providing each of the 24 zones and for selecting full disc mode operation, half disc mode operation or a position termed black register which is preferably the position when the zone setting for the red register and black register switches for a given type font are identical. In this instance, as will be explained in greater detail hereinafter, the settings on the red register switch will be ignored and the settings on the black register switch for that type font will control the selection, as will be described in greater detail hereinafter. Furthermore, the black register zone switch preferably conventionally comprises a two position switch and a 24 position switch containing each of the 24 zones and selecting between the full disc mode and the half disc mode operation. As was previously mentioned, in the example of 24 zones, this refers to the full disc mode operation and, accordingly, in the half disc mode operation, as previously described, 48 disc sizes or zones can be provided.

As shown in FIG. **11**, the rotary switch control network **850** preferably includes the conventional rotary switches, such as switch **856**, as was previously mentioned, and a relay network **860** to be described in greater detail hereinafter. The relay network **860**, enables the conventional rotary swiches, such as switch **855** to operate in conjunction with the index positioning and disc selection control circuitry previously described with reference to FIGS. **6A** and **6B**. As shown and preferred in FIG. **11**, relay network **860** includes a portion **862** which enables the selection of up to 24 different zone combinations for ten different faces if desired as well as another portion **864** which enables the selection of the half disc mode for each of the ten faces for providing up to 48 different sizes for each of the ten faces. As previously mentioned, switch **856** represents one of the typical conventional rotary switches, and by way of example, represents the **R1** switch which relates to the red register for type font A in the example given, with **R1** representing the wiper contact **870** of this switch. Similarly, **R2**, **R3**, **R4** and **R5**, respectively, represent Wiper contacts to the red register switches of fonts B, C, D and E, respectively and **B1**, **B2**, **B3**, **B4** and **B5** represents the wiper contacts for type fonts A through E, respectively, for the black register associated with each of these type fonts. The balance of the conventional rotary switches, which are preferably identical in structure and operation with the rotary switch **856** have been omitted for purposes of clarity.

As was previously mentioned, each of the red register switches **R1** through **R5**, preferably includes a three position switch having one position for half mode disc selection, a second position for full disc mode selection, which is the mode illustrated by way of example in FIG. **11** and a third position which is set when the red register and black register zones to be selected are the same for that given type font. In addition to the relay network **860** to be described in greater detail hereinafter, a conventional single-slot **880** is provided and a conventional clock generator **882** is also provided coupled to the output of the single-shot **880**. The structure and operation of the single- shot **880** and the clock pulse generator **882** is conventional and will not be described in greater detail hereinafter except for particular emphasis as it applies to the operation of the rotary switch control network **850**. The single-shot **880** may preferably receive one of three inputs in order to provide an unlatch signal via path **259** to switch **258** and therefrom to diode **314** through transistor **316**, as previously described with reference to FIG. **6B** in the discussion of the manual control mode. These inputs may preferably be the conventional pulse associated with a specific font change code provided via path **854***a* or the positive pulse provided by the red register flip-flop via path **854***b* or the black register flip-flop via path **854***a* in the conventional Alphatype when there is a shift from the red to the black register or vice versa. This positive potential provided via path **854***a*, **854***b* or **854***c* causes the single-shot **880** to provide a positive pulse at the leading edge of the input pulse to the single- shot **880** which is provided from the mixer circuit via path **854***a* from the red or black register flip-flops **854***b* and **854***c* to cause the saturation of transistor **890** and the provision of the unlatch pulse via path **259**. When the single-shot **880** turns off, the positive pulse is provided through diode **892** to the conventional clock pulse generator **882** which preferably causes the generation of a clock pulse via path **894** which clock pulse, as will be described in greater detail hereinafter, passes through whichever of the singles contact relays **898** to **906**, respectively, of portion **862**, has been energized. Thus, the single-slot **880** preferably provides both a delay in the provision of the clock pulse via path **894** to enable whichever of the appropriate relays of network **860** are to be energized to close as well as providing an unlatch pulse via path **259** to the disc selection control circuitry as was previously described.

Preferably, the single relay contact relays **898** through **906**, are selectively energized upon receipt of a positive potential from the conventional Alphatype mixer contained in the Alphatype **852** which is normally utilized to light the indicators conventionally provided in the alphatype corresponding to the type font A through E, in the example given, which has been selected, these positive potentials being selectively provided via paths **908** through **916**, respectively, from the Alphatype mixer. When the appropriate single contact relay **898** to **906** is selectively energized, this relay will close its normally open contact **898***a* through **906***a*, respectively, to pass the clock pulse provided via path **894** through to the respective associated junction point **920** through **928**. When a positive potential from the Alphatype **852** is normally utilized for red register selection is received via path **930** from the Alphatype **852**, this will energize relay coils **932** and **934**. Relay coil **932** has ganged contacts **932***a* through **932***m*, with contacts **932***a*, **932***c*, **932***e*, **932***h* and **932***k* preferably being normally open and contacts **932***b*, **932***f*, **932***j* and **932***m* being normally closed, the respective positions between normally closed and normally open, being reversed when relay coil **932** is energized along with the gang relay contact being respectively connected in pairs in junction points **920** through **928**, **932***a*-**932***b* being connected to junction point **920**, **932***c*-**932***d* being connected to junction point **922**, **932***e*-**932***f* being connected to junction to **924**, **932***h*-**932***j* being connected to junction point **926** and **932***k*-**932***m* being connected to junction point **928**. In addition, switch contacts **940** and **942** of type font A representing clock register selection position for the red register switch which normally has contact **940** closed and contact **942** open when the red register and black register are different and contact **942** being closed and contact **940** being open when the red register and black register zone selections are the same, in which instance, as previously mentioned, the setting on the black register selection switch determines the zone. Similarly, type fonts B through E preferably have switch contents **944-946**, **948-950**, **952-955**, and **956-958** for the black register position on the red register switch with the normally open and normally closed positions preferably being controlled in the same manner as previously mentioned with respect to type font A.

"Half disc mode selection"

Referring once again to FIG. **11**, the operation of the rotary switch control network **850** when the half disc mode, previously described above, has been selected shall be described. As previously mentioned, each of the red register and black register switches R1 through R5 and B1 through B5 preferably each has a half disc mode position, this half disc mode position on each of the switches being represented in FIG. **11** by normally open contact **1000** for switch R1, **1002** for switch B1, **1004** for switch R2, **1006** for switch B2, **1008** for switch R3, **1010** for switch B3, **1002** for switch R4, **1014** for switch B4, **1016** for switch R5 and **1018** for switch B5, with switch contents **1000** and **1002**, **1004** and **1006**, **1008** and **1010**, **1012** and **1014**, and **1016** and **1018** being connected in parallel to the half disc sense common line **1020** which preferably is connected to the half disc sence circuit of the conventional Alphatype. As with respect to switch contact pairs **940-942**, **944-946**, **948-950**, **952-954**, **956-960**, which are associated with the red register switches for type fonts A through E, respectively, for selecting the associated black register with setting when the red register and black register zones are the same for a given type font, there are provided ganged switch contact pairs **1022-1024**, **1026-1028**, **1030-1032**, **1034-1036**, and **1038-1040** for type fonts A through E, respectively, in relay network portion **864**, with contacts **1022**, **1026**, **1030**, **1034**, and **1038** being normally closed and switch contacts **1024**, **1028**, **1032**, **1036**, and **1040** being normally open. As was discussed with reference to switch contact pairs **940-942** Through **956-960**, respectively, with respect to relay network portion **862**, the normally closed position of switch contacts **1022**, **1026 1030**, **1034** and **1038** represents the full disc mode position of the red register selector switch for the respective type fonts A through E, with switch contacts **1024**, **1028**, **1032**, **1038** and **1040** being closed and switch contacts **1022**, **1026**, **1030**, **1034**, and **1038** ganged thereto being opened when the red register selector switch for the respective type fonts A through E is placed in the black register position, the position of these switches being as shown in FIG. **11** for both the half disc and the full disc mode as long as the red register zone selection for a given type font differs from the black register zone selection so that the red register switch is not in the black register position. In addition, each of the selector switch pairs for respective type fonts in relay network portion **862** are mechanically ganged, preferably, to the associated black register selection position switch contact pair relay network **864** so that contacts **940-942** are mechanically ganged to contacts **1022-1024**, contacts **944-946** are mechanically ganged to contacts **1026-1028**, contacts **948-950** are mechanically ganged to contacts **1030-1032**, contacts **952-954** are mechanically ganged to contacts **1034-1036** and contacts **956-950** are mechanically ganged to contacts **1038-1040**. In addition, relay coil **934** which is preferably energized upon receipt of the positive potential from the Alphatype normally utilized for red register selection (RR) via path **930**, has ganged relay contacts **934***a* through **934***m*, with relay contacts **934***b*, **934***d*, **934***f*, **934***j* and **934***m* being normally closed in the unlatched position of relay **934** and relay contacts **934***a*, **934***c*, **934***e*, **934***h* and **934***k* being normally open in this unlatched position, with the states or positions of these contacts being reversed in the latched or energized position of relay **934**. The input via path **908** to single contact relay **898** is connected in parallel to relay contacts **934***a*-**934***b* through diode **1050**, the input via path **910** to single contact relay **900** is connected in parallel to relay contacts **934***c*-**934***d* through diode **1052**, the input via path **912** to single contact relay **902** is connected in parallel to relay contact **934***e*-**934***f* through diode **1054**, the input via path **914** to single contact relay **904** is connected in parallel to relay contacts **934***h*-**934***j* through diode **1056**, and the input via path **916** to single contact relay **906** is connected in parallel to relay contacts **934***k*-**934***m* through diode **1058**. Thus, as shown and preferred in FIG. **11**, the same potential which energizes the associated single contact relay **898**, **900**, **902**, **904**, or **906** goes through the associated diode **1050** through **1058**, respectively, through the junction point between the associated relay contact pairs **934***a*-**932***b* through **934***k*-**934***m*, respectively. Thus, if the red register and black register selector switches for each of the type fonts are in the full disc mode, switch contacts **1000** through **1018**, respectively, are all opened and and no path is completed to the half disc sense circuit of the conventional Alphatype via path **1020** and the operation is as previously described above with respect to the full disc mode operation of relay portion **862.**

If, by way of example, the red register selector switch for type font A is in the half disc mode, then contact **1000** will be closed. Assuming that the red register and black register selector switches for type font A are different, switch contacts **940** and **1022** will be as shown in FIG. **11** which is normally closed, and switch contacts **942** and **1024** will be normally open. Thus, when the positive potential from the conventional Alphatype which is normally utilized for the red register selection is provided via path **930**, relay coils **932** and **934** are energized thus closing relay contacts **932***a* and **934***a*, respectively, for type font A and opening relay contacts **932***b* and **932***b* for type font A, with a similar change of state occurring for the other ganged relay contacts for relays **932** and **934**, respectively. Accordingly, when the positive potential from the Alphatype mixer normally used to light the indicator corresponding to type font A, in the example given, is received via path **908,** it will selectively energize single contact relay **898** by closing relay contact **898***a*. Preferably, at the same time, this positive potential will pass through diode **1050**, then through now closed contact **934***a*, through normally closed contact **1022**, then through now closed contact **1000** to point **R1** on path **1020** and, assuming the system is in the manual control state, wherein switch contacts **1070** and **1072** will be closed, through now closed contact **1070** to the conventional half disc sense circuitry in the conventional Alphatype which will place the conventional Alphatype in the half disc sensing mode in conventional fashion thereafter. Thus, when the clock pulse is received via path **894**, it will go through closed contact **898***a* to junction point **920**, then through now closed contact **932***a* and through normally closed contact **940** to the **R1** red register wiper contact **870**, with the conventional Alphatype circuitry processing the output of this switch in the half disc sensing mode in conventional fashion thereafter. As previously mentioned, once the proper rotary switch, in this example the **R1** rotary switch is enabled, it provides the appropriate disc selection input signal via any one of paths **350***a* through **350***f* which has been preset manually, and zone or band selection signal via any one of paths **580***a* through **580***d* which has also preferably been preset manually, to the circuitry of FIGS. **6A** and **6B** and therefrom to the conventional Alphatype sensing circuitry where it is processed in the half disc mode in conventional fashion thereafter.

Similarly, if instead the black register, for example **B1**, were in the half disc mode, relays **932** and **934** would not be energized and their contacts would in the state shown in FIG. **11**, and, utilizing type font A by way of example, half disc mode selector **1002** would be closed. Thus, in this instance, when the positive potential from the conventional Alphatype mixer normally utilized to light the indicator corresponding to type font A, by way of example, is received via path **908**, in the black register condition, single contact relay **898** would be energized and contact **898***a* closed. Preferably, at the same time, the potential which energizes relay **898** will pass through diode **1050**, through normally closed contact **934***b*, and through now closed switch contact **1002** to the **B1** contact position on path **1020** and therefrom through now closed switch **1070**, the system is in the assuming manual control state, to the conventional half disc sensing circuitry in the conventional Alphatype which will place it in the half disc sensing mode in conventional fashion thereafter. Preferably, at the same time, when a clock pulse isprovided via path **894,** it will flow through now closed contact **898***a*, through normally closed contact **932***b* to the wiper contact of the black register selector switch **B1** of type font A in this example. Similarly, this information will be provided to the disc selection control circuitry of FIGS. **6A** and **6B** through one of the paths **350***a* through **350***f* and to the manually preselected appropriate band or zone index positioning circuitry via one of the paths **580***a* through **580***d*, with this information being subsequently processed in conventional fashion in the half disc mode by the conventional Alphatype circuitry.

Lastly, if in the example given for type font A, the red register selector and the black register selector are the same, then normally closed contacts **940** and **1022** are opened with normally opened contacts **942** and **1024** closed. In this condition, in the half disc mode, the potential provided through diode **1050** through either contact **934***a* or **934***b* depending on whether the red register selection signal via path **930** is received to energize relays **932** and **934**, will be directed through switch contact **1002** in both instances with relay contacts **934***a* and **934***b* now being connected in parallel to switch contact **1002.** Similarly, in this instance, relay contacts **932***a* and **932***b* will be connected in parallel to the wiper contact of the **B1** black register rotary selector switch of type font A, in the example given. The balance of the operation with respect to type font A will preferably be as previously described above with respect to the full disc mode and half disc mode. Similarly, the operation of the relays and switches associated with type fonts B through E, respectively, is preferably identical with that previously described by way of example with reference to type font A and will not be described in greater detail hereinafter except to say that any of the above described arrangements could be independently established for each of the type fonts A through E for any given desired set of conditions. Thus, once the proper rotary switch **R1** through **R5** and **B1** through **B5**, respectively, is enabled through relay control network **850** by providing a signal to its associated wiper contact, the associated rotary switch will provide the appropriate preset disc selection input signal via one of paths **350***a* through **350***f* and the appropriate preset zone or band selection signal to the index positioning circuitry via one of paths **580***a* through **580***d* of FIGS. **6A** and **6B** with the operation thereafter being preferably as described above with respect to the automatic programmble or computer controlled operation of the lateral spacing control network **106.**

"Programmable Line Feed"

The construction and operation of the preferred system **20** of the present invention has been described above with respect to the preferred system for controlling lateral spacing in a given line on the surface of the drum **22.** The balance of the description will now primarily be directed to the preferred improved system for controlling line feed with respect to the surface of the drum **22** by control of the carriage advance drive mechanism **128** and bidirectional motor **1302** through the preferred line feed control circuit **1100.** Normally, in a conventional phototypesetting machine, such as an Alphatype manufactured by Alphatype/Filmotype of Skokie, Illinois the line feed of the drum **22** is preset for a given job by means of rotary switches which are then accessed in response to codes provided from the magnetic tape input from the Alphatype recorder through conventional processing circuitry, such as the type illustrated in FIG. **13** which is a schematic drawing of Board **26** of the conventional line or paragraph feed counter of the conventional Alphatype model **4p** or **5p,** with all designations thereon being the conventional designations used in the conventional Alphatype schematic, except where otherwise indicated. Thus, the conventional phototypesetting device, such as the Alphatype, is preset for a given job and may not readily be changed during the job, such as through control of a computer.

Referring now to FIGS. **12A, 12B** and FIG. **13,** the preferred system for enabling the programmability of such line feed will now be described. The conventional line feed enable code from either a computer interface or from a conventional Alphatype magnetic tape is preferably provided to point **1102** (FIG. **12A**) with its associated clock pulse being provided to point **1104.** This line feed enable code pulse provided at point **1102** is a positive pulse which preferably has two functions in the network illustrated in FIG. **12A.** One such function is the interrupting of current flow through relay network **1106** which, as will be described in greater detail hereinafter, determines which stages of the conventional Alphatype seven stage binary counter (FIG. **13**) are to be sensed, as would normally be accomplished by a conventional rotary switch connection to these stages. The other condition, as will be described in greater detail, is to clamp whatever function that normally would occur in the Alphatype phototypesetting system and enable the sensing of the condition of the conventional Alphatype seven stage binary counter **1218,** by way of example, which is illustrated in FIG. **13,** for the Alphatype model **5p.** With respect to the first mentioned function of the line feed enable code positive pulse, this signal is preferably provided through a resistor **1108** and a diode **1110** to the base of a transistor **1112** causing this transistor to cut off for the duration of the input pulse present at point **1104** which is equal in duration to the line feed code enable pulse present at point **1102,** thereby interrupting current flow through relay network **1106,** which preferably comprises relay coils ***1106a, 1106b, 1106c, 1106d, 1106e, 1106f,*** and ***1106h,*** one relay preferably being provided for each stage of the conventional seven stage Alphatype binary counter **128.** As will be described in greater detail hereinafter, this interruption of current flow through relays ***1106a*** through ***1106h*** will result in the unlatching of whichever of these relays has previously been latched. As shown and preferred in FIG. **12A** each of the relay coils ***1106a*** through ***1106h*** is respectively connected to an SCR ***1114a*** through ***1114h,*** respectively, which, as will be described in greater detail hereinafter, when gated causes the latching of relay coils ***1106a*** through ***1106h,*** respectively, of relay network **1106** and, consequently, when cut off, causes the unlatching of whichever of these relay coils ***1106a*** through ***1106h,*** respectively, have previously been latched.

With respect to the second mentioned function of the line feed enable code pulse, this positive pulse provided at point **1102** is provided in parallel, through a resistor **1116,** to the base of another transistor **1118,** causing this transistor **1118** to saturate which, in turn, as shown and preferred, places ground potential at point **1120** in the circuit of FIG. **12A.** The associated clock pulse for the line feed enable code provided at point **1104,** at the same time, flows through resistor **1122** to the base of another transistor **1124** which, similarly, causes this transistor **1124** to saturate. A capacitor **1126** is preferably connected to the collector of transistor **1124** and is preferably discharged when transistor **1124** saturates, thereby removing any positive potential present on point **1128** and, consequently, removing any positive potential through diode **1130** that was previously present at point **1132,** thereby causing point **1132** to go to ground potential. Point **1132** is preferably connected to the collector of a transistor **1134** of a conventional flip-flop **1136** which also includes another transistor **1138.** When point **1132** goes to near ground potential, this causes transistor **1134** to saturate which, in turn, conventionally causes transistor **1138** of flip-flop **1136** to cut off. With transistor **1134** of flip-flop **1136** saturated, another transistor **1140,** whose emitter is connected in parallel to the collector of transistor **1134** and to the base of transistor **1138,** is allowed to saturate, thereby placing a positive potential across diode **1142** connected to the collector of transistor **1140,** which positive potential is subsequently supplied through a resistor **1144** to point **1146** which, as shown and preferredin FIG. **12A,** thereby supplies a positive DC level potential which is utilized to clamp whatever functions, to be enumerated hereinafter, that normally would occur in the Alphatype phototypesetting. This clamp signal at point **1146** is supplied in parallel to diodes **1148, 1150, 1152** and **1154** with, for example, diode **1148** being connected to the conventional Alphatype circuit which controls "split-shift" to prevent its occurrence, diode **1150** being connected to the conventional Alphatype circuit which controls "lamp flashing" to prevent its occurrence, diode **1152** being connected to the conventional Alphatype circuit which controls "error condition" in the Alphatype so as to simulate this condition, and diode **1154** being preferably connected, by way of example, to the conventional Alphatype circuit which controls "reset" to prevent its occurrence. As was previously mentioned, and as will be described in greater detail hereinafter, the particular relay combination of relays ***1106a*** through ***1106h*** which is activated determines which stages of the conventional Alphatype seven stage binary counter **1218** (FIG. **13**) are to be sensed as with the conventional Alphatype prior art rotary switch connections to these stages (FIG. **13**).

In the preferred improved system of FIG. **12A**, the Alphatype bits which are utilized to control the operation of relays ***1106a*** through ***1106h,*** respectively, are preferably the conventional Alphatype bits labeled **−8, −4, −2, '1, 16, 8,** and 4, these binary bits being obtained convnetionally from the conventional Alphatype serial-to-parallel converter such as provided on board ***20k*** (not shown) of the conventional Alphatype model **4p** or **5p** which contains ten flip-flops, one output of which goes low when the flip-flop set the other output of which goes high. As shown and preferred in FIGS. **12A** and **12B**, the preferred network which is preferably connected to these flip-flop four bits **−8, −4, −2, −1, 16, 8** and **4** at points **1160, 1162, 1164, 1166, 1168, 1170** and **1172**, respectively, preferably senses the low output condition of the respective seven flip-flops of the conventional Alphatype serial-to-parallel converter associated with these bits in the set state thereof. This sensing is preferably normally ignored since transistor **1138** of flip-flop **1136** is preferably normally saturated thereby placing a positive potential through a diode **1174** on line **1176** connected to the collector of transistor **1138.** As previously mentioned, the line feed enable code and its associated clock pulse provided at points **1102** and **1104**, respectively, cause transistor **1134** to saturate and transistor **1138** to cut off thereby removing the positive potential on line **1176.** This enables the sensing of the above described conditions of the seven flip-flops associated with the bits **−8, −4, −2, −1, 16, 8** and **4,** such as provided from board **20***k* of the conventional Alphatype, to provide 127 possible combinations. During conventional or normal operation of the Alphatype, in which **78** possible combinations are available, 63 combinations being available from bits SS, **16, 8, 2, 1** and 15 combinations being available from bits **−8, −4, −2, −1,** the serial-to-parallel convertor of board **20***k,* after the ten flip-flops associated therewith are set or reset, generates a clock pulse output. This clock pulse output is a clock pulse that is normally associated with any code provided in the conventional Alphatype. This associated clock pulse, as previously mentioned, is provided at point **1104** in the circuit of FIG. **12A.** Before describing in greater detail the preferred programmable line feed operation of the improved circuit of FIGS. **12A** and **12B,** it should be noted that preferably the processing of the conventional Alphatype bits **−8, −4, −2, −1, 16, 8** and **4** for use as an indication of the selected line feed quantity and, as will be described in greater detail hereinafter, the use of the conventional Alphatype 2 bit to be used for providing a reverse feed mode, is auxiliary to the normal processing of this information in the conventional Alphatype and does not in any way interfere with this normal processing. Thus, the circuit of FIGS. **12A** and **12B** is auxiliary to the normal Alphatype processing circuitry and, because of the previously described clamp signal provided at point **1146,** these normal functions can be ignored.

By way of example, it is assumed that it is desired to program a half point (0.5) line feed, the operation with respect to different value points of line feed being preferably identical with the various combinations required being evident from the illustrative example of FIG. **12B** and a subsequently described relay truth table pertaining thereto. If the network of FIG. **12A** were to sense that the **−8** bit input provided via patch **1160** were low due to the **−8** flip-flop in the conventional Alphatype serial-to-parallel convertor on board **20***k* (not shown), this would allow, through diode **1180** and resistor **1182** connected to the base if a transistor **1184,** this transistor **1184** to cut off or come out of saturation. Thus, when a clock pulse is sensed at point **1104,** it will flow through resistor **1186** and diode **1188** connected in parallel thereto the collector of now cut off transistor **1184,** and, therefrom, through resistor **1190** to the gate of SCR **1114***a,* thereby allowing current flow from the collector of transistor **1112,** through relay coil **1106***a* of relay network **1106,** through SCR **1114***a* to ground thereby latching relay **1106***a.* Because of the preferred normaly biasing of transistor **1112,** the collector will be at a predetermined positive potential, such as +20 volts in the example shown in FIG. **12A.** The trailing edge of the clock pulse provided at point **1104** which is associated with the line feed quantity code pulse, also preferably causes transistor **1124** to cut off due to the positive potential normally provided at point **1192.** As transistor **1124** cuts off, capacitor **1126** preferably charges, passing a positive potential through diode **1128** to place a positive potential at point **1132.** This causes transistor **1134** of flip-flop **1136** to cut off and, thereby, causes transistor **1138** to saturate. Thus, when transistor **1138** has returned to this normally saturated condition, a positive potential is once again placed on line **1176** through diode **1174** and the condition of the flip-flops of the Alphatype serial-to-parallel converter provided via paths **1160** to **1172,** respectively, is no longer sensed. In addition, the clamp signal previously provided to point **1146** is cut off thereby allowing the normal processing of codes by the conventional Alphatype in its normal typesetting process. Accordingly, the circuit of FIG. **12A** provides a means of controlling which combination of the seven relays **1106***a* to **1106***h* of relay network **1106** will be utilized to sense both sides of the conventional flip-flops in the conventional seven stage binary counter **1218** of the Alphatype, by way of example, illustrated in FIG. **13** (FIGS. **13A** and **13B** taken together), through the conventional contacts of this binary counter illustrated in FIG. **12B,** these contacts being conventionally numbered by Alphatype as **1Uϕ, 1U1, 2Uϕ, 2U1, 4Uϕ, 4U1, 8Uϕ, 8U1, 1Tϕ, 1T1, 2Tϕ, 2T1, 4Tϕ** and **4T1,** with contacts **1Uϕ**and **1U1** preferably, for the **−8** flip-flop, **2Uϕ** and **2U1** for the **−4** flip-flop, **4Uϕ** and **4U1** for the **−2** flip-flop, **8Uϕ** and **8U1** for the **−1** flip-flop, **1Tϕ** and **1T1** to the **16** flip-flop, **2Tϕ** and **2T1** for the **8** flip-flop and **4T0** and **4T1** for the **4** flip-flop, this controlled sensing being accomplished through associated diodes **1200, 1202, 1204, 1206, 1208, 1210, 1212,** respectively, whose cathodes are respectively connected in parallel to point **1214,** thereby sensing a predetermined condition of the seven stage binary counter **1218** of the conventional Alphatye which stops the line feed.

The conventional Alphatype circuitry line feed counter **1218** illustrated in FIG. **13,** is "told" when to initiate line feed by a "-reset command signal". This command signal enables the line feed that has previously been programmed at the same time that the conventional seven stage Alphatype binary counter **1218** is reset. Thereafter, line feed occurs thereby feeding pulses into point **1216** (FIG. **13**) in conventional fashion which, in turn, drives the conventional seven stage counter **1218** until the counter **1218** reaches the predetermined count that reflects a low potential at point **1214.** This potential, when coupled to point **1220** (FIG. **13**) causes the line feed to stop. The connection of point **1220** to point **1214** preferably disconnects the normally provided conventional rotary switch bank illustrated in FIG. **13** as well as the normal conventionally provided five additional rotary switch banks of the conventional Alphatype which are not illustrated in FIG. **13,** so that sensing occurs solely through the circuitry of FIGS. **12A** and **12B.** Suitable means, if desired, can be utilized to enable sensing from both the conventional rotary switches provided in the conventional Alphatype and/or the arrangement illustrated in FIGS. **12A** and **12B** in any desired combination to provide both conventional manual control and the aforementioned programmable control with or without preference to one of the normally ten available type faces provided from the normally available five type fonts, by way of example, in the Alphatype. Normally, the conventional Alphatype is able to sense line feed for the ten normally available faces from one of six typical rotary switches, one such typical switch **1222** being shown by way of example in FIG. **13**, or from another rotary switch bank **1224** being illustrated by way of example in FIG. **13.** With the arrangement previously described with reference to FIGS. **12A** and **12B,** rotary switch bank **1224** can be sensed when the conventional Alphatype normally would conventionally sense it or this sensing can be ignored and only the programmable line feed provided with the arrangement of FIGS. **12A** and **12B** could be sensed. Furthermore, it should be noted that preferably the programmable line feed provided by the preferred arrangement of FIGS. **12A** and **12B** can be continuously varied throughout the job, if desired, whereas the conventional line feed provided by the rotary switch bank of the conventional Alphatype is fixed for the job unless the job is halted and the switches manually changed.

If desired, as shown and preferred in FIG. **12B,** relays **1106*a*** through **1106*h*,** respectively, can be connected in various combinations to light displays, such as conventional light emitting diodes **1230** through **1264,** respectively, or incandescent lamps to provide a visual display of the selected programmable line feed by these lamps **1230** through **1264,** these lamps **1230** through **1264,** respectively, being connected in common to a power source (not shown) through point **1266,** with a positive potential provided at point **1266** going through whichever associated relay contacts are closed to apply a positive potential to the appropriate lamp display provided from the combination of lamps **1230** through **1264,** with relay contacts **116*a*1** through **1106*a*12** being associated with relay coil **1106*a*,** relay contacts **1106*b*1** through **1106*b*6** being associated with relay coil **1106*b*,** relay contacts **1106*c*1** through **1106*c*4** being associated with relay coil **1106*c*,** relay contacts **1106*d*1** through **1106*d*4** being associated with relay coil **1106*d*,** relay contacts **1106*e*1** through **1106*e*10** being associated with relay coil **1106*e*,** relay contacts **1106*f*1** through **1106*f*6** being associated with relay coil **1106*f*** and relay contacts **1106*h*1** through **1106*h*4** being associated with relay coil **1106*h*.** Each of the respective relay contacts associated with relay coils **1106*a*** through **1106*h*,** respectively, as shown and preferred, are ganged with relay contacts **1106*a*1, 1106*a*3, 1106*a*5, 1106*a*7, 1106*a*9** and **1106*a*11,** being normally closed in the unlatched condition of relay **1106*a*** and contacts **1106*a*2, 1106*a*4, 1106*a*6, 1106*a*8, 1106*a*10** and **1108*a*12** being normally open in the unlatched condition of relay **1106*a*** with these conditions being reversed when relay **1106*a*** is latched. As shown and preferred, relay contact **1106*a*11** being is connected to point **1Uϕ** and relay contact **1106212** being connected to point **1U1.** Similarly, contacts **1106*b*1, 1106*b*3,** and **1106*b*5** of relay **1106*b*,** are normally closed in the unlatched condition of relay **1106*b*** and contacts **1106*b*2, 1106*b*4, 1106*b*6** are normally open in the unlatched condition of relay **1106*b*** with these conditions being reversed when relay **1106*b*** is latched. In addition, contact **1106*b*5** is preferably connected to point **2Uϕ** and contact **1106*c*6** is connected to point **2U1.** Similarly, contacts **1106*c*1** and **1106*c*3** of relay **1106*c*** are normally closed in the unlatched condition of relay **1106*c*** and contacts **1106*c*2** and **1106*c*4** are normally open in the unlatched condition of relay **1106*c*** with these conditions being reversed when relay **1106*c*** is latched. Contact **1106*c*3** is preferably connected to point **4Uϕ** and contact **1106*c*4** is preferably connected to point **4U1.** Similarly, with respect to relay **1106*d*,** contacts **1106*d*1** and **1106*d*3** are normally closed and contacts **1106*d*2** and **1106*d*4** are normally open in the unlatched condition of relay **1106*d*** with these conditions being reversed when relay **1106*d*** is latched. Contact **1106*b*3** preferably is connected to point **8Uϕ** and contact **1106*d*4** is preferably connected to point **8U1.** Similarly, with respect to relay **1106*e*,** contacts **1106*e*1, 1106*e*3, 1106*e*5, 1106*e*7, 1106*e*9** are normally closed and contacts **1106*e*2, 1106*e*4, 1106*e*6, 1106*e*8** and **1106*e*10** are normally open in the unlatched condition of relay **1106*e*** with these conditions being reversed when relay **1106*e*** is latched. Contact **1106*e*9** preferably is connected to point **1Tϕ** and contact **1106*e*10** preferably is connected to point **1T1.** Similarly, with respect to relay **1106*f*,** contacts **1106*f*1, 1106*f*3** and **1106*f*5** are normally closed and contacts **1106*f*2, 1106*f*4, 1106*f*6** are normally open in the unlatched condition of relay **1106*j*** with these conditions being reversed when relay **1106*j*** is latched. Contact **1106*f*5** preferably is connected to point **4Tϕ** and contact **1106*f*6** preferably is connected to point **2T1.** Lastly, with respect to relay **1106*h*,** contacts **1106*h*1** and **1106*h*3** are normally closed and contacts **1106*h*2, 1106*h*4** are normally open in the unlatched condition of relay **1106*h*** with these conditions being reversed in the latched condition of relay **1106*h*.** Contact **1106*h*3** preferably is connected to point **4Tϕ** and contact **1106*h*4** preferably is connected to contact **4H1.** Thus, as described above, after the line feed enable code has been received, the seven aforementioned conventional Alphatype binary bits provided from the serial-to-parallel converter of, by way of example, board **20*k*** of the conventional Alphatype, are sensed to provide the programming of the line feed quantity which determines the spacing between the lines, which, by way of example, as shown and preferred in FIGS. **12A** and **12B,** can be anywhere between 0 and 39 ½ points, with a point being conventionally defined as approximately 1/72 of an inch, in ½ point increments. If desired, the conventional Alphatype circuit shown in FIG. **13,** can readily be modified to count from 0 to 39 ¾ points in ¼ point increments. Furthermore, conventional mechanical modifications can readily be employed so that any unit of measurement, such as millimeters, can be utilized to provide the line feed quantity which may be programmed in accordance with the circuitry of FIGS. **12A** and **12B,** the appropriate flip-flop of the conventional serial-to-parallel convertor of the Alphatype, by way of example, which is low being sensed while the others are high, such as in the example previously given with respect to programming a half point line feed, which would be visually indicated by the lighting of lamp **1232** (FIG. **12B).**

The operation of the relay network **1106** comprises relays **1106*a*** through **1106*h*** with the circuit of FIGS. **12A** and **12B** is preferably in accordance with the following truth table for providing the desired line feed quantity value between 0 and 39 ½, with the presently illustrated arrangement of FIG. **13,** where a 1 condition indicates the respective relay **1106*a*** to**1106*h*** is latched and a 0 condition indicates that the respective relay **1106*a*** through **1106*h*** is unlatched. The counter stages on counter **1218** to which the relays **1106*a*** through **1106*h*** are connected are also included in the table. Line feed is shown in terms of points by way of example and any combination can be closed to obtain any value between 0 and 39 ½ in accordance with the following truth table, by way of example.

TRUTH TABLE

(FIG. 13)

	BINARY BITS			
	−8	−4	−2	−1
Line	Counter Stage			
Feed	1u	2u	4u	8u
4.5	1	0	0	1
4.0	0	0	0	1
3.5	1	1	1	0
3.0	0	1	1	0
2.5	1	0	1	0
2.0	0	0	1	0
1.5	1	1	0	0
1.0	0	1	0	0
.5	1	0	0	0
0	0	0	0	0

FIG. 13

	BINARY BITS		
	16	8	4
Line	Counter Stage		
Feed	1t	2t	4t
35	1	1	1
30	0	1	1
25	1	0	1
20	0	0	1
15	1	1	0
10	0	1	0
5	1	0	0
0	0	0	0

"REVERSIBLE LINE FEED"

As was previously mentioned, preferably if the line feed quantity code provided from the magnetic tape or from the computer, includes the "2 bit", the preferred reversible line feed control circuit **1300** of FIG. **14** will be enabled, the 2 bit reverse code preferably being part of the line feed quantity code provided to the line feed control circuitry **1100** which controls the carriage advance drive mechanism **128.** Accordingly, in the preferred system of the present invention shown in FIGS. **12A** and **12B** with respect to the programmable line feed quantity control circuit **1100,** and with respect to FIG. **14** with respect to the reversible line feed control circuitry **1300** the line feed quantity may be programmably changed or not changed, as desired, while enabling the reverse mode operation of the carriage advance drive mechanism **128.** Thus, the reversible line feed control circuit **1300** has been separately illustrated in block diagram in FIG. **8** for controlling bidirectional motor **1302** associated with the carriage advance drive mechanism **128.**

Referring now to FIGS. **14** and **15,** the construction and operation of the reversible line feed control circuit **1300** shall be described in greater detail with reference to its operation, by way of example, in a phototypesetting system. Accordingly, a separate function preferably commands the reverse line feed until a predetermined position of the galley is sensed, this position usually being the bottom of the galley which is normally equivalent to the bottom of the cylinder or drum **22** although, if the bottom of the galley is not equivalent to the bottom of the cylinder or drum **22,** this bottom of galley position can still be sensed by presetting the sensing mechanism for this position. Preferably, at the time that this predetermined position of the galley is sensed, the reversing stops and the system **1300** returns to the forward mode if previously in that mode at which time the line feed is now programmed for the desired quantity and/or direction in the manner previously described with reference to the operation of the circuit of FIGS. **12A** and **12B.** Preferably, the reverse line feed mode is accomplished in response to the line feed enable code being followed by the swung conventional Alphatype code **1A** as illustrated in the timing diagram A and H of FIG. **15.** It should be noted that preferably no other bits can be included with this Alphatype code **1A** as this would preferably not be a desirable condition for the system. In the conventional Alphatype, line feed occurs as a result of reset. Another conventional function of reset is to cause the drum cylinder **22** to conventionally return to its right margin which represents the extreme right hand portion of the job being typeset, if this cylinder were not already at the right margin because of a previous reset or the starting of a job. If desired, a separate code can preferably be provided to prepare to provide interline advance in either direction, with appropriate processing of this code, without the return of the cylinder **22** to the right margin. Of course, the direction in amount of interline advance would be determined by the previous line feed enable code.

The line feed enable code provided through point **1175** (FIG. **12A**) peferably removes the positive clamp from point **1350** which is connected to point **1175** thereby unsaturating a transistor **1352** whose base is connected through a resistor **1354** and a diode **1356** to point **1350.** Transistor **1352** is preferably normally saturated when a positive clamp is present at point **1350** through diode **1356** and resistor **1354** to the base of transistor **1352.** The collector of transistor **1352** is preferably connected to junction point **1358** which is at ground potential when transistor **1352** is saturated. When transistor **1352** is unsaturated, junction point **1358** is preferably no longer at ground potential and the condition of the 2 bit flip-flop in the conventional Alphatype serial-to-parallel converter, such as on board **20***k*, whose outputs are at points **1360** and **1362,** which are, respectively, **2′** and **2°**, with point **1360** connected to **2′** side of this flip-flop. Accordingly, preferably when the 2 bit stage on conventional Alphatype board **20***k* is set, in the example given, the **2°** line at point **1362** is low and the **2′** line at point **1360** is high. Therefore, the associated clock pulse that is provided to point **1364** will pass through resistor **1366,** then through diode **1368** to junction point **1370** connected to the base of a transistor **1372** of a conventional flip-flop **1374** whose other transistor is **1376.** This will preferably cause transistor **1372** of flip-flop **1374** to cut off thereby conventionally causing transistor **1376** to saturate. When transistor **1372** is cut off, this will remove any positive potential that was previously passed through a diode **1380** to a voltage divider network **1382** whose resistor values are preferably chosen to forward bias another transistor **1384** whose base is connected to voltage divider network **1382.** Thus, when transistor **1372** is cut off, transistor **1384** becomes saturated allowing diode **1386** connected to the collector thereof to preferably supply a positive potential to a forward/reverse enable relay coil **1388** to open normally closed contact **1388***a* and close normally open contact **1388***b* of this relay **1388** to preferably place bidirectional motor **1302** in the reverse mode. On the other hand, if the line feed enable code does not include the 2 bit, bit, point preferably **1360** would be low and point **1362** would be high thereby allowing the associated clock pulse provided to point **1364** to pass through resistor **1390,** then through diode **1392** to junction point **1394** connected to the base of transistor **1376,** thereby causing transistor **1394** to cut off. This, in turn, causes transistor **1372** to saturate causing a positive potential to pass through diode **1380** to the voltage divider network **1382** which, in turn, causes point **1396** to have a reverse bias potential for transistor **1384** whose base is connected thereto and, accordingly, thereby preferably cutting off transistor **1384.** The cutting off of transistor **1384** preferably unlatches relay **1388** thereby placing contact **1388***a* in the normally open position and contact **1388***b* in the normally closed position, which will place the system **1300** and bidirectional motor **1302** in the forward line feed mode.

Preferably, the only time that the reversible line feed control circuit **1300** will sense the 2° and $2'$ bit of the Alphatype 2 bit flip-flop which indicates the reverse line feed mode, is when junction point **1358** is not at ground potential. This condition, preferably, only occurs when the positive clamp is removed from point **1350.** When this positive clamp is present at point **1350,** as was previously mentioned, transistor **1352** is saturated, thereby applying gound potential to junction point **1358** and, through diodes **1400** and **1402,** respectively, to junction points **1404** and **1406,** respectively, thereby clamping all clock pulses occurring at point **1364** from passing through diodes **1368** or **1392,** respectively, regardless of the state present at points **1360** and **1362.**

If manual operation of the reversible line feed control circuit **1300** is desired, normally open switch **1410** may be closed which will then, preferably, pass a positive potential through network **1412,** then through diodes **1414** and **1416** connected to flip-flop **1374,** thereby causing transistors **1372** and **1376** to preferably switch to the opposite states from their previous condition, thereby enabling a manual latching and unlatching of the forward/reverse relay **1388.** Relay contact **1388***b* shown in its normally closed condition, connects the forward winding of bidirectional motor **1302** to junction point **1420.** When relay contact **1388***a,* shown in its normally open condition is closed when relay **1388** is latched, it connects the reverse winding of motor **1302** to junction point **1420.**

In the conventional motor control circuitry, such as in the Alphatype, such as represented by motor control circuit **1422** in FIG. **14,** the "-reset pulse" provided to point **1424** causes transistor **1426** of a conventional flip-flop **1428,** whose other transistor is transistor **1430,** to saturate which, conventionally, causes transistor **1430** to cut off. This, in turn, causes a normally cut off transistor **1432,** whose emitter is tied to the emitters of transistors **1430** and **1426** and whose base is connected to the base of transistor **1430,** to saturate, transistor **1432** normally being cut off. When transistor **1432** is saturated, it passes a positive potential through a diode **1434** connected to the collector thereof to energize a line feed enable relay **1436** which, in the conventional Alphatype, supplies AC hot to the conventional unidirectional motor used in the Alphatype. Diode **1434** preferably isolates transistor **1432** from the "return to the bottom of galley" control circuit **1438** to be described in greater detail hereinafter. As shown and preferred in FIG. **14,** relay **1436** has associated contacts **1436***a* and **1436***b,* with relay contact **1436***a* being normally open and relay contact **1436***b* being nomally closed. Preferably, relay contact **1436***a* supplies AC hot to junction point **1420** allowing the bidirectional motor **1302** to run in either the forward or reverse direction depending on the position of relay contacts **1388***b* and **1388***a.* The AC at point **1420** is preferably rectified in conventional fashion by a diode **1440** charging a capacitor **1432.** When the line feed has been completed, relay **1436** preferably unlatches causing contact **1436***a* to open and, accordingly, contact **1436***b* to close. This, in turn, shorts out diode **1440** which then connects the positive terminal of the now charged capacitor **1442** to point **1420** thereby allowing discharge of capacitor **1442** through either contacts **1388***b* or **1388***a* through the appropriate motor winding causing the immediate braking of bidirectional motor **1302** to. thus, preferably providing a dynamic braking for motor **1302.** Thus, preferably, the dynamic braking potential capacitor **1442** is preferably only charged during line feed, this potential only being applied after a line feed to brake the motor **1302.**

Now the "return to the bottom of the galley" control circuit **1438** shall be described with reference to FIG. **14.** As previously mentioned above, the "return to galley bottom" code, provided to point **1450,** preferably inititates line feed in the reverse direction until the bottom of the galley is sensed. This sensed position can be adjusted to any point along the axis of the galley, the axis of the galley preferably being identical with the axis of the drum of cylinder **22.** The "return to galley bottom" code, which is preferably a positive clock pulse, is provided to point **1450** and passes through diode **1452** and resistor **1454** to the collector of a transistor **1456** of a conventional flip-flop **1458,** whose other transistor is transistor **1460,** causing the collector of transistor **1456** to be positive while the base of transistor **1460** is made positive because of an R-C network **1462–1464.** This causes transistor **1460** to cut off which, in turn, conventionally causes transistor **1456** to saturate. This, in turn, causes another transistor **1466** whose base is connected to the collector of transistor **1456** to also saturate, thereby placing a positive potential at point **1470** connected to the emitter of transistor **1466.** This positive potential at point **1470** passes through diode **1472** and diode **1474** which causes the latching of relays **1388** (if not previously latched) and **1436,** respectively. As was previously described, diode **1434** isolates this latching potential provided through diode **1474** from transistor **1432.** Similarly, diode **1386** isolates this latching potential provided through diode **1472** from transistor **1384.** This preferably will initiate reverse line feed in the manner previously described above with referance to the reversible line feed control circuit **1300.**

Thus, in the return to galley bottom mode, the line feed is preferably independent of the normal counting and switching circuitry, whether the conventional circuitry the Alphatype or the programmable line feed circuitry described with reference to FIGS. **12A** and **12B** is utilized. Preferably, while reverse line feed is activated, the positive potential provided to point **1480** passes through diode **1482** to provide a counter clamp signal in order to prevent the driving of the conventional Alphatype counter **1218** (FIG. **13**) by clamping the collector of transistor **1486** (FIG. **13**) of the conventional Alphatype counter circuitry illustrated in FIG. **13** and represented by board **26** of the conventional Alphatype. In addition, the positive potential at point **1480** is also preferably passed in parallel through diode **1488** to the line feed right margin control point (LFRM terminal) on conventional Alphatype board **28** (not shown) which preferably prevents the further processing of typesetting until the return to galley bottom mode is completed. The completion of this return to galley bottom mode is sensed when a switch **1490,** which is normally open, is closed, such as a normal contact switch operation, thereby passing a positive potential through diode **1492** due to network **1494** thereby resetting flip-flop **1458** by applying a positive potential to the collector of transistor **1460**, while the base of transistor **1456** which is made positive because of the R-C network **1496–1498** associated therewith. This causes transistor **1456** to cut off which, in turn, conventionally causes transistors **1460** to saturate. This, in turn, causes transistor **1466** to cut off, thereby removing the positive potential at point **1470**, thereby unlatching relays **1388** and **1436**. It should be noted that if transistor **1384** had previously been saturated, relay **1388** would preferably not unlatch in this condition.

Referring now to FIG. **15**, the timing of the various signals present in the reversible line feed control circuit **1300** shall be described by way of example. In Graph A of FIG. **15**, the line feed enable code associated clock pulse is represented by pulse **1510** and the line feed quantity or amount code associated clock pulse is represented by pulse **1512**. This pulse **1512** could also graphically represent the return to galley bottom code associated clock pulse. In addition, in Graph A, pulse **1514** represents an interline feed code associated in clock pulse. As shown and preferred in FIG. **15**, apart form Graph I wherein pulse **1516** represents the interline feed code, with its associated clock pulse being represented by pulse **1514**, which can occur at any time and does not have to be associated with a line feed enable code in order to create a line advance without a return to the right margin, all other pulse represented in Graphs A through H of FIG. **15** are preferably dependent on the line feed enable code pulse **1510**. Normal processing in the typesetting system preferably occurs a slight time after the end of the hold-off pulse **1518** whicch holds off the normal typesetting process, as shown in graph H of FIG. **15**. Pulses **1510**, **1512**, and **1514** preferably occur at a normal typesetting rate. Graph B of FIG. **15** represents the enable window for the line feed amount code, the reverse code or the return to galley bottom code and is graphically represented by pulse **1520**. The pulses graphically represented in Graph C of FIG. **15** represent the cut off of the previous relays, as represented by **1522**. Pulses **1524** and **1526** in Graph D of FIG. **15** graphically represent the period of time during the flip-flops on board **20K** of the conventional Alphatype, which comprise the conventional serial-to-parallel converter, are either set or reset. Pulse **1528** in Graph E of FIG. **15** graphically represents the latch pulse for required relays ***1u***, ***2u***, ***4u***, ***8u***, ***1t***, ***2t*** and ***4t*** of counter **1218** (FIG. **13**) corresponding, respectively, to the -8, -4, -2, -1, **16**, **8** and **4** bits of the conventional Alphatype code. Pulse **1530** graphically illustrated in Graph F of FIG. **15** represents the clock pulse associated when the 2 bit is present during the enable window represented by pulse **1520**, which pulse **1530** will command reverse line feed. Pulse **1532** graphically illustrated in Graph G of FIG. **15** represents the Alphatype code **1A** pulse which is associated with the line feed enable code and, if present without any other bits during the enable window of pulse **1520**, will enable reverse line feed to the galley bottom. As was previously mentioned, pulse **1518** of Graph H of FIG. **15** graphically represents the hold-off period for reverse line feed and pulse **1516** of Graph I, of FIG. **15** represents the interline feed code. Graph J of FIG. **15** graphically represents the line feed enable code **1533** corresponding to its associated clock pulse **1510**. It should be noted that when the code **1A** pulse **1532** is present, the line feed amount code or 2 bit code pulse **1512** or **1530**, respectively, preferably cannot be present.

"Recorder Attachment for Converting Standard Key Strokes to Control Codes."

Referring now to FIG. **3**, the preferred arrangement for an attachment for a conventional phototype system recorder, such as a conventional Alphatype magnetic recorder for provided control tapes for the Alphatype phototypesetting system is shown with this recorder attachment generally being referred to by the reference numeral **1600**. Preferably, the recorder attachment **1600** converts the standard key strokes for the letters L, F, R, and I, so that, by way of example, the letter F produces the line feed enable code utilized in the above described circuitry, the letter L produces the line feed amount or quantity code utilized in the above described circuitry, the letter R produces the "return to galley bottom" code utilized in the above described circuitry and the letter I produces the interline feed code previously referred to. A key board **1600**, which is preferably auxiliary to the conventionally provided keyboard for such a recorder (not shown), is preferably provided and preferably contains conventional push button switches **1602** through **1636** labeled **0,5,10,15,20,25,30,35,0,0.5,1,1.5,2,2.5, 3,3.5,4,** and **,4.5,** respectively. Switches **1602** through **1616** are preferably in one row and switches **1618** to **1636** are preferably in a second row. Preferably, one switch must be held down in each row with the switches **1602** through **1616** in the top row preferably applying a positive potential V_1, such as **+20** volts by way of example, to the top of a relay **1640** when one of the top row switches **1602** through **1616** is closed or depressed, each switch **1602** through **1616** preferably having associated ganged contacts *a*, *b*, and *c*, with contacts *a* and *c* being normally open and contact *b* being normally closed with this condition reversed when the appropriate switch **1602** through **1616** is depressed. When one of the bottom row switches **1618** through **1636**, respectively, is closed or depressed, this will preferably apply ground potential to the bottom of relay **1640**, thereby energizing relay **1640**. Bottom row switches **1618** and **1636**, respectively each comprise three ganged contacts *a*, *b* and *c*, with contacts *a* and *c* being normally open and contact *b* being normally closed with the condition thereof being reversed when the appropriate bottom switch **1618** to **1636**, respectively, is depressed. Relay **1640** has associated relay contacts ***1640a***, ***1640b***, ***1640c***, ***1640d***, ***1640e***, ***1640f***, ***1640h*** and ***1640j***, with contacts ***1640a***, ***1640c***, **1640** and ***1640h***, being normally open and contacts ***1640b***, ***1640d***, ***1640f*** and ***1640j*** being normally closed. When relay **1640** is latched, the condition of these contacts is reversed. Contacts ***1640a*** and ***1640b*** are associated with the letter R, contacts ***1640c*** and ***1640d*** are associated with the letter I, contacts ***1640e*** and ***1640f*** are associated with the letter L and contacts ***1640h*** and ***1640j*** are associated with the letter F. Thus, when relay **1640** is energized, the conventional letter codes for R,I,L, and F are swung, as the normally shown condition of the associated contacts in FIG. **3** is reversed, the letters L,F,R and I being swung from their conventional typesetting function to produce the above referred to codes from the letter code input to letters R,I,L and F from the conventional typewriter recorder provided via paths **1650**, **1652**, **1654** and **1656**, respectively. Thus, when the swung letter L goes to L' with contact ***1640e*** being closed, then whichever switch or switches **1602** through **1616** is closed will open the normally closed switch ganged to path **1660** to isolate the balance of the circuit and connect the L′ output pulse through the associated diode network 1670 to the appropriate bit lines 1672 through 1676 for switches 1602 through 1616 pertaining to the codes needed to be programmed for the proper relays to be latched and to path 1660 which connects to the bottom of switches 1618 and 1636 which, in turn, connect through the appropriate closed ganged switches 1618 through 1636 to isolate the balance of the circuit and connect the L′ pulse through the associated diode network 1690 to the appropriate bit lines 1678 through 1684 for the bottom row switches 1618 through 1636 to provide the combination codes indicated in the truth table previously described by way of example with reference to FIGS. 12A and 12B. For example, to provide $11\frac{1}{2}$ (11.5) points as the encoded programmed line feed, switch 1606*a* is closed to connect to path 1660 and path 1676 through diodes 1692 and 1694 of diode network 1670, contact 1606*b* opening while contacts 1606*a* and 1606*c* are closed. Path 1660 is then connected through now closed switch 1624*a* of the bottom row, which represents 1.5 together with the previously closed switch 1606*a* representing 10, which taken together represents $11\frac{1}{2}$ points, with contact 1624*b* now being opened. Switch 1624*a* preferably connects to point 2012 which connects the L′ output to paths 1684 and 1682 representing the −8, −4 bit lines to provide a code of 8, −8, −4, by way of example, for a programmed line feed of 11.5 points. Preferably, at the same time that the above condition occurs, relay 1640 contacts 1640*a* through 1640*j* are simultaneously closed.

In order to put a line feed enable code on the tape which is preferably represented, by way of example, by the letter F being swung, when relay 1640 is latched, the F′ signal goes through now closed contact 1640*h* and diodes 1700 through 1702 to record the line feed enable code on the tape. Similarly, the "return to galley bottom" code and the interline feed code are recorded on the tape by swung letters R and I through their appropriate now closed contacts 1640*a* and 1640*c* and their associated diode pair networks (not shown). The network comprising switch 1750 and resistor diode network 1752 preferably permits normal operation of the recorder while the letters L,F, R and I, by way of example, are utilized in their additional capacity. A conventional switch 1754 is preferably provided for selection between the forward and reverse mode by enabling recording to the 2 bit on the tape when switch 1754 is closed indicating the reverse mode, as previously described.

DISC CLAMP

Referring now to FIG. 10, an improved disc clamp, generally referred to by the reference numeral 1800, for holding the various discs 40 through 50 in place on the shaft as well as providing spacing between these discs and enabling removal of these discs is shown. Preferably, the clamp 1800 consists of a threaded socket 1802 and a threaded insertable member 1804 which is threadably mateable within the socket 1802. The threads in the socket 1802 are preferably symmetrically tapered to create a threaded tapered receptacle 1806 with the tapering preferably being outwardly away from the shaft 56. Similarly, the threads on insertable portion 1804 are also congruently tapered so as to be threadably mateable within the receptacle 1806 of socket 1802. Preferably the tapered insertable portion 1804 has a plurality of spaced apart, such as four spaced 90° apart, circumferential horizontal slits 1808 (only one being shown in FIG. 10) which permit insertable portion 1804 to be easily slid along shaft 56 when it is removed from the socket portion 1802 and to clamp tightly to the shaft 56 when portion 1804 is threaded into receptacle 1806 of socket 1802 which closes the slit so as to clamp insertable portion 1804 about shaft 56. Preferably, the disc clamp 1800 is made of a resilient material which will return to its original position upon relaxation of pressure, such as rubber or plastic, so as to allow a squeezing or pressure applying action as threadable portion 1804 is threaded into socket 1802. Insertable portion 1804 is also preferably provided with a shoulder portion 1810 about the periphery thereof so as to act as a stop for the disc, a typical disc 40 being shown by way of example in FIG. 10. In utilizing the clamp 1800 of FIG. 10, the socket portion 1802 is removed from shaft 56, the disc 40, by way of example, is then inserted onto the shaft 56 through the opening therein and placed over insertable portion 1804 to rest against the shoulders 1810 and, thereafter, socket 1802 is again placed on the shaft and threaded onto insertable portion 1804 so as to have front shoulder portion 1812 of socket 1802 up against the other side of the disc 40 and sandwich it between the shoulder portion of insertable portion 1804 and the shoulder portion 1812 of socket 1802. This threading of socket portion 1802 onto insertable portion 1804 tightens portion 1804 on this shaft so as to clamp the two portions of the clamp 1800 to each other as well as to the shaft and hold the disc 40 in place. Preferably, the width of the clamp 1800, and, preferably, primarily the width of the socket 1802 is chosen as to enable the provision of the desired spacing between adjacent discs 42 and 44, by way of example, when each of the clamps 1800 is mounted on the shaft 56, one such clamp being preferably provided for each disc.

The balance of the circuitry and structure omitted from the above detailed description of the system 20 of the present invention is preferably conventional such as readily available in a conventional Alphatype phototypesetting system and, accordingly, will not be described in any greater detail hereinafter as it will be readily understood to one of ordinary skill in the art.

It is to be understood that the above described embodiments of the invention are merely illustrative of the principles thereof and that numerous modifications and embodiments of the invention may be derived within the spirit and scope thereof.

What is claimed is:

1. A drum control system for providing a predetermined incremental lateral spacing on a drum surface to be accessed in response to a request signal therefor, said system comprising means for rotatably driving said drum about the longitudinal axis thereof; means operatively connected to said drum rotatable driving means for controlling the degree of rotation of said drum in response to said request signal to provide said predetermined incremental lateral spacing, said rotation control means comprising a plurality of optically readable encoded discs, each of said discs having at least a first circumferentially extending band comprising a plurality of optically readable sense marks, said plurality of discs being coaxially rotatably mounted for simultaneous incremental rotation with said drum in response to said request signal, each of said sense marks is a given band corresponding to a predetermined uniform proportionate degree of incremental rotation of said drum, each of said disc circumferential bands being encoded to corre-

spond to a different uniform proportionate degree of incremental rotation of said drum, said plurality of discs comprising at least a pair of said coaxially mounted discs spaced apart from each other with said first bands optically aligned with each other; said rotation control means further comprising a first light source means mounted so as to be optically common to both discs of said pair and optically alignable for illumination of said first bands when energized, a pair of optical reader means optically aligned with said first common light source and associated therewith, each one of said optical reader means being associated with a different one of said discs of said pair and being optically alignable with said first band associated with said associated disc, each of said optical reader means being selectively energizable and being responsive to said sense marks on said associated first band when said optical reader is selectively energized and said first light source illuminates said first band for providing an output signal indicative of the proportionate degree of incremental rotation of said disc, and means for substantially simultaneously selectively energizing said optical reader associated with the disc band corresponding to the requested incremental lateral spacing and said first common light souce in response to said request signal; said system further comprising braking means operatively connected to said drum rotatable drive means for halting the rotatable drive of said drum in response to a braking signal, and comparator means operatively connected to said braking means and to receive said request signal and said selectively energized optical reader output signal for providing said braking signal to said braking means when said selectively energized optical reader output signal corresponds to said requested incremental lateral spacing, whereby the proportionate degree of rotation of said drum corresponds to said requested incremental lateral spacing.

2. A drum control system in accordance with claim **1** wherein said plurality of optically readable encoded discs comprises at least one other of said coaxially mounted discs with each of said plurality of discs being spaced apart from each other and with said first bands being optically aligned with each other; and said rotation control means further comprises a second light source means mounted so as to be common to said one other disc and optically alignable for illumination of said first band on said one other disc when energized; an additional optical reader means optically aligned with said second light source and associated therewith and being optically alignable with said first band associated with said one other disc, said pair of optical reader means and said additional optical reader means being selectively energizable and being responsive to said sense marks on said associated first band when said associated one of said optical readers is selectively energized and said associated optically alignable light source illuminates said associated first band for providing said output signal indicative of the proportionate degree of incremental rotation of said disc, said optical reader selective energizing means being capable of selectively energizing any one of said optical reader means and substantially simultaneously energizing the light source associated with said selectively energized optical reader means in response to said request signal.

3. A drum control system in accordance with claim **2** wherein each of said discs further comprises at least a second one of said circumferentially extending bands radially spaced apart from said first band and comprising a plurality of optically readable sense marks, each of said second bands being optically alignable with each other; said system further comprising a first common incrementally movable platform means, said first and second light source means and said associated optical reader means being mounted on said first common incrementally movable platform means so as to be simultaneously movable therewith, said first platform means having at least a first incremental index position in which said first and second light source means and said associated optical reader means are commonly optically aligned with said associated first bands and a second incremental index position in which said first and second light source means and said associated optical reader means are common optically aligned with said associated second bands, and means for incrementally moving said first common platform to a predetermined incremental index position corresponding to the band to be optically read in response to said request signal for optically aligning said associated light source and optical reader means with the band capable of providing the requested incremental lateral spacing for said drum, said selective energization means being enabled when said incremental indexed platform has been positioned for providing said capable band to be read.

4. A drum control system in accordance with claim **3** further comprising a second incrementally movable common platform means, said drum and said first incrementally movable common platform means being mounted on said second common platform means for simultaneous movement therewith, said second common platform being axially movable in the direction of the longitudinal axis of the drum, and means for incrementally axially moving said second common platform in response to said request signal to a different predetermined axial position on said drum surface relative to a fixed access location, said rotation control means providing said predetermined lateral spacing at said fixed access location by rotation of said drum about said longitudinal axis at said different predetermined relative axial position, said rotation control means being enabled when said predetermined axial position has been obtained, whereby a predetermined lateral spacing at a predetermined axial position of said drum may be provided by axial and rotational movement thereof in response to said request signal.

5. A drum control system in accordance with claim **4** wherein said second common platform axial moving means further comprises bidirectional means for bidirectionally incrementally axially moving said second platform in a forward direction along said drum longitudinal axis in a first state and in the opposite reverse direction along said drum longitudinal axis in a second state, and means for controlling the state of said bidirectional means in response to said request signal.

6. A drum control system in accordance with claim **4** wherein said second platform incrementally axially movable means comprises carriage advance means operatively connected to said second platform for axially incrementally moving said second platform in a predetermined axial direction, motor drive means for driving said carriage advance means in said predetermined direction, and control means capable of dynamically incrementally varying the quantity of incremental axial movement of said second platform operatively connected to said motor drive means for controlling the operation thereof in response to a dynamically variable request signal for a different predetermined axial position of said drum relative to said fixed access location, whereby line feed for the drum may be dynamically varied in accordance with a dynamic variation in said axial position request signal.

7. A drum control system in accordance with claim **6** wherein said control means comprises comparator means operatively connected to said motor drive means and to receive said axial position request signal and a reference signal corresponding to said request axial position for providing a braking signal to halt said motor drive means when said requested predetermined axial position is reached by said drum.

8. A drum control system in accordance with claim **7** wherein said control means further comprises flip-flop means for providing said reference signal in response to said axial position request signal.

9. A drum control system in accordance with claim **6** wherein said motor drive means comprises a bidirectional motor drive means for incrementally axially moving said second platform in a forward direction along said drum longitudinal axis in a first state and in the opposite reverse direction along said drum longitudinal axis in a second state, said axial position request signal comprising a state control signal portion, said control means comprising means for selecting the state of said bidirectional motor means in response to said state control signal for axially advancing the said platform in the direction provided by said selected state.

10. A drum control system in accordance with claim **9** wherein said state selection means comprises means for sensing a predetermined axial position of said drum when in the second state and selecting the first state when said predetermined position is sensed, said second platform being incrementally axially advanced in said forward direction in said first state.

11. A drum control system in accordance with claim **9** wherein said control means further comprises comparator means operatively connected to said motor drive means and to receive said predetermined axial position request signal and a reference signal corresponding to said requested axial position for providing an output signal when said drum has been advanced to said request axial position, said bidirectional motor drive means having a first winding which is energized in said first state for energizing said motor drive means in said forward direction and a second winding which is energized in said second state for energizing said motor drive means in said reverse direction, said control means further comprising dynamic braking means operatively connected to said comparator means for providing a braking signal of predetermined duration to said second winding in response to said output signal when said motor drive means has previously been in said first state and said first winding has been substantially simultaneously deenergized to dynamically brake said motor drive means to a halt.

12. A drum control system in accordance with claim **11** wherein said braking signal providing means comprises a capacitor means for providing said braking signal, said capacitor means being charged only during axial advance of said drum when said motor drive means is in said first state and only discharging to provide said braking signal of predetermined duration dependent on the discharge time constant in response to said output signal.

13. A drum control system in accordance with claim **3** wherein said first common platform incremental moving means comprises a rotary solenoid means incrementally driven in response to said request signal, gearing means operatively connected to said first common platform means, and rotary-to-linear conversion means operatively connected to said rotary solenoid means for driving said gearing means for linearly incrementally moving said first common platform in response to said drive of said rotary solenoid means.

14. A drum control system in accordance with claim **3** wherein said first common platform incremental moving means comprises bidirectional drive means for incrementally moving said first common platform in a first direction toward the center of the discs in response to a first optimum direction control signal and in the opposite direction away from the center of the discs in response to a second optimum direction signal, means for sensing a present position of said platform and for providing an output signal indicative thereof; direction control signal providing means operatively connected to said first platform present position sensing means for receiving said indicative output signal therefrom and to receive said request signal and responsive thereto for providing either said first or said second direction control signal to said bidirectional drive means dependent on the optimum shortest incremental movement of said first common platform from said initial position required to reach a final position of said first common platform associated with the radially located disc band and corresponding to the requested lateral spacing; means for dynamically sensing a current incremental position of said first common platform and providing an output signal indicative thereof, each incremental first platform position corresponding to a different common radially spaced band on the discs; and condition responsive means operatively connected to receive said current position indicative signal and said request signal for providing a braking signal to said bidirectional drive means for halting the incremental movement of said platform when said first platform current position corresponds to said final position associated with the radially located disc band corresponding to the requested lateral spacing.

15. A drum control system in accordance with claim **14** wherein said bidirectional drive means comprises a rotary solenoid means incrementally driven in response to said request signal, gearing means operatively connected to said first common platform means and rotary-to-linear conversion means operatively connected to said rotary solenoid means for driving said gearing means for linearly incrementally moving said first common platform from said initial position to said final position in response to said drive of said rotary solenoid means in response to said provided optimum direction control signal.

16. A drum control system in accordance with claim **14** wherein said incremental moving means further comprises memory means for temporarily storing at least the portion of the request signal corresponding to the radially spaced band requested, said memory means being operatively connected to said condition responsive means for providing said temporarily stored request signal portion thereto until said memory means is cleared of said stored position.

17. A drum control system in accordance with claim **14** wherein each of said discs further comprises at least a third one of said circumferentially extending bands radially spaced apart from said first and second bands and comprising a plurality of optically readable sense marks, each of said third bands being optically alignable with each other, said first common platform means further having at least a third incremental index position in which said first and second light source means and said associated optical reader means are commonly optically aligned with said associated third bands.

18. A drum control system in accordance with claim **3** wherein said first common platform incremental moving means comprises drive means for incrementally moving said first common platform from an initial position to a final position associated with the radially located disc band corresponding to the requested lateral spacing, and means for dynamically sensing a current incremental position of said first common platform and providing an output signal indicative thereof, each incremental first platform position corresponding to a different common radially spaced band on the discs; and condition responsive means operatively connected to receive said current position indicative signal and said request signal for providing a braking signal to said driven means for halting the incremental movement of said platform when said first platform current position corresponds to said final position associated with the radially located disc band corresponding to the requested lateral spacing.

19. A drum control system in accordance with claim **2** wherein each of said light source means includes a light focusing means associated with each of said associated optical reader means for focusing said associated light source at a predetermined location on said first band in optical alignment with said associated optical reader means.

20. A drum control system in accordance with claim **2** wherein said selective energizing means comprises means for deenergizing the previously selectively energized light source and associated optical reader means in response to a band change code signal prior to selectively energizing the light source and associated optical reader means corresponding to the disc band capable of providing the requested incremental lateral spacing for the drum in accordance with said request signal.

21. A drum control system in accordance with claim **20** wherein said selective energizing means comprises gating means and an associated relay coil means operatively connected to said gating means for control thereby associated with each of said discs, each of said optical reader means and said light source means having an associated relay coil means for energizing said optical reader means and light source means respectively associated therewith when energized, each of said relay coil means associated with the respective light source means optically aligned with said associated optical reader means and said associated optical reader means associated relay coil means being operatively connected together, said gating means being responsive to said request signal to substantially simultaneously energize the relay coil means associated with the optical reader means corresponding to the disc band capable of providing the requested incremental lateral spacing for thd drum and the relay coil means associated with energizing said associated light source means in response to said request signal, said gating means further being responsive to said band change code signal to deenergize any of said relay coil means previously energized.

22. A drum control system in accordance with claim **2** wherein said selective energizing means comprises gating means and an associated relay coil means operatively connected to said gating means for control thereby associated with each of said discs, each of said optical reader means and said light source means having an associated relay coil means for energizing said optical reader means and light source means respectively associated therewith when energized, each of said relay coil means associated with respective light source means optically aligned with said associated optical reader means and said associated optical reader means associated relay coil means being operatively connected together, said gating means being responsive to said request signal to substantially simultaneously energize the relay coil means associated with the optical reader means corresponding to the disc band capable of providing the requested incremental lateral spacing for the drum and the relay coil means associated with enegizing said associated light source means in responsive to said request signal.

23. A drum control system in accordance with claim **2** further comprising a plurality of clamping means for removably coaxially clamping each of said discs on a common shaft at predetermined axial location therealong spaced apart by a predetermined axial distance determined by the longitudinal axial length of said clamping means, one of said clamping means being provided for each of said discs.

24. A drum control system in accordance with claim **23** wherein said clamping means comprises a threaded socket slidable on said shaft and an insertable threadable member having a resilient threadable portion threadably insertable into said socket and a mounting portion for said associated disc, said resilient portion being slidable on said shaft prior to said threadable insertion in said socket and being squeezed to tighten against said shaft for preventing slidable movement therealong when said member has been threaded into said socket to fix said clamping means at one of said predetermined axial locations.

25. A drum control system in accordance with claim **1** wherein said first light source means includes a light focusing means associated with each of said associated optical reader means for focusing said associated light source at a predetermined location on said first band in optical alignment with said associated optical reader means.

26. A drum control system in accordance with claim **1** wherein each of said optical reader means comprises photocell means.

27. A drum control system in accordance with claim **1** wherein said selective energizing means comprises means for deenergizing the previously selectively energized light source and associated optical reader means in response to a band change code signal prior to selectively energizing the light source and associated optical reader means corresponding to the disc band capable of providing the requested incremental lateral spacing for the drum in accordance with said request signal.

28. A drum control system in accordance with claim **27** wherein said selective energizing means comprises gating means and an associated relay network means operatively connected to said gating means for control thereby, each of said optical reader means and said first common light source means having an associated relay coil means for energizing said optical reader means and light source means respectively associated therewith when energized, said relay network means comprising a parallel connection of said associated relay coil means with said first light source means associated relay coil being connected in common to both of said optical reader means associated relay coil means, said gating means being responsive to said request signal to substantially simultaneously energize the relay coil means associated with the optical reader means corresponding to the disc band capable of providing the requested incremental lateral spacing for the drum and the relay coil means associated with enegizing said associated light source means in response to said request signal, said, gating means further being responsive to said band change code signal to deenergize any of said relay coil means previously energized.

29. A drum control system in accordance with claim **1** wherein said selective energizing means comprises gating means and an associated relay network means operatively connected to said gating means for control thereby, each of said optical reader means and said first common light source means having an associated relay coil means for energizing said optical reader means and light source means respectively associated therewith when energized, said relay network means comprising a parallel connection of said associated relay coil means with said first light source means associated relay coil being connected in common to both of said optical reader means associated relay coil means, said gating means being responsive to said request signal to substantially simultaneously energize the relay coil means associated with the optical reader means corresponding to the disc band capable of providing the requested incremental lateral spacing for the drum and the relay coil means associated with energizing said associated light source means in response to said request signal.

30. A drum control system in accordance with claim **1** further comprising a plurality of clamping means for removably coaxially clamping each of said discs on a common shaft at predetermined axial locations therealong spaced apart by a predetermined axial distance determined by the longitudinal axial length of said clamping means, one of said clamping means being provided for each of said discs.

31. A drum control system in accordance with claim **30** wherein said clamping means comprises a threaded socket slidable on said shaft and an insertable threadable member having a resilient threadable portion threadably insertable in said socket and a mounting portion for said associated disc, said resilient portion being slidable on said shaft prior to said threadable insertion in said socket and being squeezed to tighten against said shaft by being threaded into said socket for preventing slidable movement therealong when said member has been threaded into said socket to fix said clamping means at one of said predetermined axial locations.

32. A drum control system for providing a predetermined incremental lateral spacing on a drum surface to be accessed in response to a request signal therefor, said system comprising means for rotatably driving said drum about the longitudinal axis thereof; means operatively connected to said drum rotatable driving means for controlling the degree of rotation of said drum in response to said request signal to provide said predetermined incremental lateral spacing, said rotation control means comprising a plurality of optically readable encoded discs, each of said discs having at least a first circumferentially extending band comprising a plurality of optically readable sense marks, said plurality of discs being coaxially rotatably mounted for simultaneous incremental rotation with said drum in response to said request signal, each of said sense marks in a given band corresponding to a predetermined uniform proportionate degree of incremental rotation of said drum, each of said disc circumferential bands being encoded to correspond to a different uniform proportionate degree of incremental rotation of said drum, said plurality of discs comprising at least first and second coaxially mounted discs spaced apart from each other with said first bands optically aligned with each other; said rotation control means further comprising a first light source means mounted so as to be optically common to at least said first disc and optically alignable for illumination of said first band thereon when energized, and a second light source means mounted so as to be optically common to said second disc and optically alignable for illumination of said first band thereon when energized, a first optical reader means optically aligned with said first light source and associated therewith and a second optical reader means optically aligned with said second light source and associated therewith, said first and second optical reader means being associated with said first and second discs respectively and being optically alignable with said first band associated with said associated disc, each of said optical reader means being selectively energizable and being responsive to said sense marks on said associated first band when said associated one of said optical readers is selectively energized and said associated optically alignable light source illuminates said associated first band for providing an output signal indicative of the proportionate degree of incremental rotation of said disc, and means for substantially simultaneously selectively energizing said optical reader associated with the disc band corresponding to the requested incremental lateral spacing and said associated optically alignable light source in response to said request signal; said system further comprising braking means operatively connected to said drum rotatable drive means for halting the rotatable drive of said drum in response to a braking signal, and comparator means operatively connected to said braking means and to receive said request signal and said selectively energized optical reader output signal for providing said braking signal to said braking means when said selectively energized optical reader output signal corresponds to said requested incremental lateral spacing, whereby the proportionate degree of rotation of said drum corresponds to said requested incremental lateral spacing.

33. A drum control system in accordance with claim **32** wherein each of said discs further comprises at least a second one of said circumferentially extending bands radially spaced apart from said first band and comprising a plurality of optically readable sense marks, each of said second bands being optically alignable with each other; said system further comprising a first common incrementally movable platform means, said first and second light source means and said associated optical reader means being mounted on said first common incrementally movable platform means so as to be simultaneously movable therewith, said first platform means having at least a first incremental index position in which said first and second light source means and said associated optical reader means are commonly optically aligned with said associated first bands and a second incremental index position in which said first and second light source means and said associated optical reader means are common optically aligned with said associated second bands, and means for incrementally moving said first common platform to a predetermined incremental index position corresponding to the band to be optically read in response to said request signal for optically aligning said associated light source and optical reader means with the band capable of providing the requested incremental lateral spacing for said drum, said selective energization means being enabled when said incremental indexed platform has been positioned for providing said capable band to be read.

34. A drum control system in accordance with claim **33** further comprising a second incrementally movable common platform means, said drum and said first incrementally movable common platform means being mounted on said second common platform means for simultaneous movement therewith, said second common platform being axially movable in the direction of the longitudinal axis of the drum, and means for incrementally axially moving said second common platform in response to said request signal to a different predetermined axial position on said drum surface relative to a fixed access location, said rotation control means providing said predetermined lateral spacing at said fixed access location by rotation of said drum about said longitudinal axis at said different predetermined relative axial position, said rotation control means being enabled when said predetermined axial position has been obtained, whereby a predetermined lateral spacing at a predetermined axial position of said drum may be provided by axial and rotational movement thereof in response to said request signal.

35. A drum control system in accordance with claim **34** wherein said second common platform axial moving means further comprises bidirectional means for bidirectionally incrementally axially moving said second platform in a forward direction along said drum longitudinal axis in a first state and in the opposite reverse direction along said drum longitudinal axis in a second state, and means for controlling the state of said bidirectional means in response to said request signal.

36. A drum control system in accordance with claim **34** wherein said second platform incrementally axially movable means comprises carriage advance means operatively connected to said second platform for axially incrementally moving said second platform in a predetermined axial direction, motor drive means for driving said carriage advance means in said predetermined direction, and control means capable of dynamically incrementally varying the quantity of incremental axial movement of said second platform operatively connected to said motor drive means for controlling the operation thereof in response to a dynamically variable request signal for a different predetermined axial position of said drum relative to said fixed access location, whereby line feed for the drum may be dynamically varied in accordance with a dynamic variation in said axial position request signal.

37. A drum control system in accordance with claim **36** wherein said control means comprises comparator means operatively connected to said motor drive means and to receive said predetermined axial position request signal and a reference signal corresponding to said requested axial position for providing a braking signal to halt said motor drive means when said requested predetermined axial position is reached by said drum.

38. A drum control system in accordance with claim **37** wherein said control means further comprises flip-flop means for providing said reference signal in response to said axial position request signal.

39. A drum control system in accordance with claim **36** wherein said motor drive means comprises a bidirectional motor drive means for incrementally axially moving said second platform in a forward direction along said drum longitudinal axis in a first state and in the opposite reverse direction along said drum longitudinal axis in a second state, said axial position request signal comprising a state control signal portion, said control means comprising means for selecting the state of said bidirectional motor drive means in response to said state control signal for axially advancing the second platform in the direction provided by said selected state.

40. A drum control system in accordance with claim **39** wherein said state selection means comprises means for sensing a predetermined axial position of said drum when in the second state and selecting the first state when said predetermined position is sensed, said second platform being incrementally axially advanced in said forward direction in said first state.

41. A drum control system in accordance with claim **39** wherein said control means further comprises comparator means operatively connected to said motor drive means and to receive said predetermined axial position request signal and a reference signal corresponding to said requested axial position for providing an output signal when said drum has been advanced to said requested axial position, said bidirectional motor drive means having a first winding which is energized in said first state for energizing said motor drive means in said forward direction and a second winding which is energized in said second state for energizing said motor drive means in said reverse direction, said control means further comprising dynamic braking means operatively connected to said comparator means for providing a braking signal of predetermined duration to said second winding in response to said output signal when said motor drive means has previously been in said first state and said first winding has been substantially simultaneously deenergized to dynamically brake said motor drive means to a halt.

42. A drum control system in accordance with claim **41** wherein said braking signal providing means comprises a capacitor means for providing said braking signal, said capacitor means being charged only during axial advance of said drum when said motor drive means is in said first state and only discharging to provide said braking signal of predetermined duration dependent on the discharge time constant in response to said output signal.

43. A drum control system in accordance with claim **33** wherein said first common platform incremental moving means comprises a rotary solenoid means incrementally driven in response to said request signal, gearing means operatively connected to said first common platform means, and rotary-to-linear conversion means operatively connected to said rotary solenoid means for driving said gearing means for linearly incrementally moving said first common platform in response to said drive of said rotary solenoid means.

44. A drum control system in accordance with claim **33** wherein said first common platform incremental moving means comprises bidirectional drive means for incrementally moving said first common platform in a first direction toward the center of the discs in response to a first optimum direction control signal and in the opposite direction away from the center of the discs in response to a second optimum direction signal, means for sensing a present position of said platform and for providing an output signal indicative thereof; direction control signal providing means operatively connected to said first platform present position sensing means for receiving said indicating output signal therefrom and to receive said request signal and responsive thereto for providing either said first or said second direction control signal to said bidirectional drive means dependent on the optimum shortest incremental movement of said first common platform from said initial position required to reach a final position of said first common platform associated with the radially located disc band corresponding to the requested lateral spacing; means for dynamically sensing a current incremental position of said first common platform and providing an output signal indicative thereof, each incremental first platform position corresponding to a different common radially spaced band on the discs; and condition responsive means operatively connected to receive said current position indicative signal and said request signal for providing a braking signal to said bidirectional drive means for halting the incremental movement of said platform when said first platform current position corresponds to said final position associated with the radially located disc band corresponding to the requested lateral spacing.

45. A drum control system in accordance with claim **44** wherein said incremental moving means further comprises memory means for temporarily storing at least the portion of the request signal corresponding to the radially spaced band requested, said memory means being operatively connected to said condition responsive means for providing said temporarily stored request signal portion thereto until said memory means is cleared of said stored portion.

46. A drum control system in accordance with claim **44** wherein said bidirectional drive means comprises a rotary solenoid means incrementally driven in response to said request signal, gearing means operatively connected to said first common platform means and rotary-to-linear conversion means operatively connected to said rotary solenoid means for driving said gearing means for linearly incrementally moving said first common platform from said initial position to said final position in response to said drive of said rotary solenoid means in response to said provided optimum direction control signal.

47. A drum control system in accordance with claim **44** wherein each of said discs further comprises at least a third one of said circumferentially extending bands radially spaced apart from said first and second bands and comprising a plurality of optically readable sense marks, each of said third bands being optically alignable with each other, said first common platform means further having at least a third incremental index position in which said first and second light source means and said associated optical reader means are commonly optically aligned with said associated third bands.

48. A drum control system in accordance with claim **33** wherein said first common platform incremental moving means comprises drive means for incrementally moving said first common platform from an initial position to a final position associated with the radially located disc band corresponding to the requested lateral spacing, and means for dynamically sensing a current incremental position of said first common platform and providing an output signal indicative thereof, each incremental first platform position corresponding to a different common radially spaced band on the discs; and condition responsive means operatively connected to receive said current position indicative signal and said request signal for providing a braking signal to said drive means for halting the incremental movement of said platform when said first platform current position corresponds to said final position associated with the radially located disc band corresponding to the requested lateral spacing.

49. A drum control system in accordance with claim **32** wherein each of said light source means includes a light focusing means associated with each of said associated optical reader means for focusing said associated light source at a predetermined location on said first band in optical alignment with said associated optical reader means.

50. A drum control system in accordance with claim **32** wherein said selective energizing means comprises means for deenergizing the previously selectively energized light source and associated optical reader means in response to a band change code signal prior to selectively energizing the light source and associated optical reader means corresponding to the disc band capable of providing the requested incremental lateral spacing for the drum in accordance with said request signal.

51. A drum control system in accordance with claim **50** wherein said selective energizing means comprises gating means and as associated relay coil means operatively connected to said gating means for control thereby associated with each of said discs, each of said optical reader means and said light source means having an associated relay coil means for energizing said optical reader means and light source means respectively associated therewith when energized, each of said relay coil means associated with the respective light source means optically aligned with said associated optical reader means and said associated optical reader means associated relay coil means being operatively connected together, said gating means being responsive to said request signal to substantially simultaneously energize the relay coil means associated with the optical reader means corresponding to the disc band capable of providing the requested incremental lateral spacing for the drum and the relay coil means associated with energizing said associated light source means in response to said request signal, said gating means further being responsive to said band change code signal to deenergize any of said relay coil means previously energized.

52. A drum control system in accordance with claim **32** wherein said selective energizing means comprises gating means and an associated relay coil means operatively connected to said gating means for control thereby associated with each of said discs, each of said optical reader means and said light source means having an associated relay coil means for energizing said optical reader means and light source means respectively associated therewith when energized, each of said relay coil means associated with the respective light source means optically aligned with said associated optical reader means and said associated optical reader means associated relay coil means being operatively connected together, said gating means being responsive to said request signal to substantially simultaneously energize the relay coil means associated with the optical reader means corresponding to the disc band capable of providing the requested incremental lateral spacing for the drum and the relay coil means associated with energizing said associated light source means in response to said request signal.

53. A drum control system in accordance with claim **32** further comprising a plurality of clamping means for removably coaxially clamping each of said discs on a common shaft at predetermined axial locations therealong spaced apart by a predetermined axial distance determined by the longitudinal axial length of said clamping means, one of said clamping means being provided for each of said discs.

54. A drum control system in accordance with claim 53 wherein said clamping means comprises a threaded socket slidable on said shaft and an insertable threadable member having a resilient threadable portion threadably insertable into said socket and a mounting portion for said associated disc, said resilient portion being slidable on said shaft prior to said threadable insertion in said socket and being squeezed to tighten against said shaft by being threaded into said socket for preventing slidable movement therealong when said member has been threaded into said socket to fix said clamping means at one of said predetermined axial locations.

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